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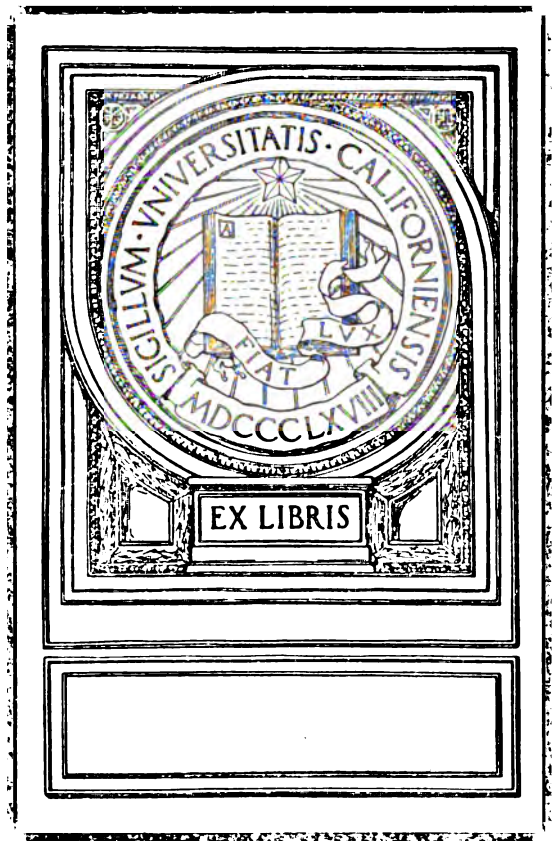
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MODERN AMERICAN TANNING

A PRACTICAL TREATISE ON THE MANUFACTURE OF LEATHER

COMPILED FROM ORIGINAL ARTICLES DESCRIBING MODERN METHODS PRINTED IN "HIDE AND LEATHER" AND WRITTEN BY WELL KNOWN TANNERY FOREMEN, SUPERINTENDENTS AND CHEMISTS

VOLUME II

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PUBLISHER'S NOTICE.

The second volume of "Modern American Tanning" is a continuation of the first volume, issued in the year 1902. The first book was welcomed by the trade at home and abroad and it was necessary to print several editions.

The literature of the tanning industry is not extensive and the few books published are mostly too abstruse for the general reader. "Modern American Tanning" does not aim to be a scientific dissertation upon tanning, but rather a compilation of articles written at different times by successful and practical men, whose long and active experience has made them specialists on the subject they write upon. It is not possible for one man to write upon all the many departments of the manufacture of leather, excepting in a theoretical way. The chapters contained in this book, to the hypercritical reader, may in some instances seem to conflict, if not actually contradict each other. This is inevitable where there are honest differences of opinion among practical men, each of whom have won success by their methods.

No attempt is made by any writer to air his erudition, but rather to express in plain, simple language his information gained by experience in his special department in the tannery. It will not be possible for anyone interested in any branch of tanning to read this volume without finding much that is of interest, value, and profit.

There are many controversial matters connected with the leather manufacture. Opinions widely differ, but the progressive student with a catholic spirit will welcome the ideas of practical men, even when he cannot agree with them.

The art of making leather is one of evolution and development. There are many moot questions not yet decided. The varied articles relating to the chrome tannage as applied to belting, harness and sole leather, as well as to upper stock and glazed kid, are a valuable feature in this second volume of "Modern American Tanning." There are many pages describing the use of extracts; and the debatable question of the drum tannage of sole leather is discussed by the most successful men in this new field of tanning. In this, as in the first volume of "Modern American Tanning," the articles are compiled from the columns of HIDE AND LEATHER, to which journal practical men, and masters of their trade, in all departments of the industry contribute from time to time.

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Tannery Equipment and Management.

SPEEDING UP MACHINERY.

The speeding up of machinery to increase the output of a factory is very unwise, says an experienced man. Driving a machine beyond its normal capacity soon destroys the best there is in it; new parts will be required and the work on the machine will not be up to the standard.

Recently while in the finishing room of a factory the proprietor told me that he was afraid he had been making a big mistake of late. He said he had increased the output in his factory somewhat, and had put the extra work on his staking machine. Where his skins had formerly been soft and mellow they were now hard, but the finish on them was still excellent.

LOSS SUSTAINED BY DRIVING STAKING MACHINE BEYOND LIMIT.

He said he had been in somewhat of a quandary, but had arrived at the conclusion that the trouble was in the staking. There was a limit, he said, to all things; he had driven his staking beyond that limit; and had found that a machine, as well as an individual, would some time resent abuse.

He told me the machine had been driven so fast that the blade of the knife had jumped over the skin instead of taking hold and staking it properly. He had come to the conclusion that nothing was to be gained by running this machine beyond its normal capacity. He not only believed that the hardness of the skins was due to this, but he had found that he was ruining his machine, and during the past few months he had to replace many parts which, with ordinary usage, would have lasted a long time.

He said that had the skins even been staked in a satisfactory manner he would have lost more money on the wear of the machine alone than he had saved in labor, and that, as he had not sufficient work to

warrant his putting in an extra machine, he had concluded to have the extra work done by hand labor; that is, by placing the skins in a perch and arm-crutching them. This arm-crutching gives the same results as the machine-staking.

ARM-CRUTCHING GOOD TO HELP OUT.

This, of course, is not an argument in favor of going back to the old method of arm-crutching, but where a man wants to get out a few extra dozens of skins each day it is much better to arm-crutch them than to force the staking machine beyond its normal capacity, thus injuring the machine and slighting the skins.

In these days of competition and progress a man who has the reputation of turning out a good article and having a good trade is risking considerable when he attempts to push his machinery beyond the point where first-class work can be done. He is liable to wake up some morning and find that some other enterprising fellow has captured his best customers.

EFFICIENCY AND ECONOMY OF FUEL IN TANNERIES.

In many cases the stoppage of waste means the difference between running a tannery at a loss and having a balance on the right side of the ledger at the end of the year. Old Commodore Vanderbilt was asked how he had made the New York Central within a few years one of the best paying railroads in the country. He replied, "By stopping rat holes." A large number of tanners are pouring in at the bung only to waste at the spigot.

FIFTY PER CENT OF COAL WASTED.

In the average tannery there are usually serious losses going on continuously. In the writer's own experience these losses have often amounted to 50 per cent of the coal bill and sometimes more. Moreover, by the introduction of the proper, and often very simple, changes these enormous losses have been stopped and the coal bills actually reduced to one-half the former amount and in some cases even less.

The great decrease in the use of bark and the increase in the use of extracts and chemical tannages have in recent years vitally changed the aspect of the fuel problem. Nowadays very few tanneries have spent tan enough for their furnaces and therefore most of them have to supplement with coal or other expensive fuel; while many are dependent entirely upon coal for their fuel. This condition makes the fuel problem one of greater importance than ever, for as the use of bark has decreased the cost of power has increased.

PRODUCTION AND USE OF STEAM.

The fuel problem deals not only with the methods and apparatus used for the generation of steam but also with the equally important matter of the proper and economical distribution and use of the steam after it has been made. In short, the fuel or power problem divides itself properly into two separate problems, which are stated as follows: (1) Are we *making* our steam economically? and (2) Are we *using* our steam economically? Or, in other words, first, are we getting the greatest possible amount of steam from a dollar's worth of fuel, and, secondly, are we getting the greatest available power and heating value from that steam in the form of mechanical energy to run the machinery and in the form of heat in the leaches, dry lofts and elsewhere?

When these two divisions of the fuel problem have been carefully investigated and tested, the tanner knows exactly where he stands in regard to his power costs. All waste is then located and he is in a position to intelligently prevent waste and so bring his plant, as a whole, up to the highest possible degree of working efficiency and lowest possible cost of operation.

FUEL AND APPLIANCES.

The first part of the fuel problem, treating of the generation of steam or energy, deals in particular with the various kinds and grades of fuel, including tanbark, wood chips, coal, wood and gas; the furnaces and various kinds of devices for burning the different fuels; the boilers for absorbing the heat and converting it into steam; and all other systems, devices and appliances connected with the generation of steam, such as feed water heaters, economizers, draught appliances, flue cleaners, ash disposal, scale prevention, tan presses, back arches, systems of air admission, boiler settings, combustion chambers, coverings, etc.

ECONOMICAL USE OF STEAM.

The second part of the fuel problem, i. e., the use of steam, deals particularly with the design of the steam headers and piping conducting the steam from the boilers to the engines and to various heating apparatus; the design, location, condition and number of the engines themselves; the use of the exhaust steam; the return or use of the water of condensation; the prevention of loss caused by back pressure; the economical use of engine oil; the various systems of power transmission, including belt, rope and electrical transmission; methods of steam heating; steam and power pumps for water and liquors, and all other questions bearing upon the economical use of steam.

In the average tannery there are usually serious losses going on continuously both in the production and in the use of steam. Often there is found loss of heat, steam and fuel at each of the points above mentioned.

FIND CAUSE OF LOSSES.

Therefore to bring a plant up to the highest possible working efficiency it is first necessary to find the location and causes of the various losses. After this is done, the proper means for stopping these losses can be determined, the changes made, and the fuel bill reduced.

Waste of fuel and loss of heat can generally be exactly located and effectively remedied. For example, take the case of a steam boiler and its furnace, which comes under the first division of the fuel problem. Now, the boiler and furnace combined may be correctly considered as a device whose purpose is to convert a dollar's worth of fuel into the greatest possible amount of steam.

COST AND HEAT VALUE OF FUELS.

Therefore the first question is whether or not the fuel used contains the greatest amount of available heat for a dollar. This important question can be determined by comparing the heat values of the different accessible fuels with their prices. Now, the heat value of a fuel is measured in terms of heat units known as British thermal units, or B. T. U., which is simply the amount of heat required to raise the temperature of one pound of water one degree Fahrenheit. Thus, if a fuel is tested and a pound is found to contain 14,000 B. T. U., it contains heat enough to raise 14,000 pounds of water one degree. Therefore, for instance, if a $2.00 coal (2,000 pounds per ton) has a heat value of 12,000 B. T. U., and a $3.00 coal has a heat or calorific value of 14,000 B. T. U., it is evident that the first coal gives a heat value of 120,000 heat units for one cent, while the second coal gives only 93,333 heat units for one cent. Thus it is seen that, although the second coal is more costly and is richer in heat units per pound, the poorer coal gives the greater heating value for the money by over 28 per cent.

This rough illustration shows the general method for arriving at the value of various fuels, but it should be understood that, in addition to the calorific test, a fuel should also be tested for moisture, volatile matter, fixed carbon, sulphur and ash, all of which have special bearing on combustion and must be taken into careful consideration before the final selection of the fuel. This general method applies not only to coals, but to all kinds and grades of fuels, so that, for instance, sawdust at a given price per ton can be accurately compared to coal or gas at given prices.

EFFICIENCY TESTS.

The next question which arises is whether or not the boiler and furnace are converting a maximum percentage of the heat of this fuel into useful steam. To determine this question, an efficiency test is made on the boiler and furnace. This simply means that the heat value of the fuel that is fired into the furnace is measured for a given time (10 to 24 hours) by weighing the fuel of a known heat value; and at the same time measuring the useful steam generated in the boiler by measuring or weighing the feed water evaporated. This fuel, and the steam made by the fuel, are both figured in heat units; thus, if during the boiler test, the average amount of fuel burned per hour contained 28,000,000 B. T. U., and the average steam generated per hour by that fuel contained 14,000,000 B. T. U., it is evident that just 50 per cent of the heat in the fuel has been converted into steam, and this percentage is known technically as the thermal efficiency of a boiler and furnace.

During a boiler test records may also be kept to show the temperature of the flue gases, of the outside air, of the air entering the ashpit and of the air in the fire room; also the temperatures of the fuel (especially in case tan is burned) and the temperature of the fire at different points. In addition, the draught should be tested for intensity or pressure at different points. Now, as combustion is essentially a chemical action, it is of much value to analyze the flue gases which are the products of combustion.

HOW TO STOP WASTE.

Limit of space will not here permit a lengthy discussion of the chemistry of combustion, so the writer must simply state that, with the aid of flue gas analyses, temperature and draught records, the exact cause of poor efficiency can usually be accurately determined. In short, these show whether the fuel is being completely and perfectly burned and, in case of low efficiency, they clearly show the engineer how to place his finger on the exact cause of the trouble and how to stop the consequent waste.

When the boiler test has been made and the efficiency has been found to be, say, 50 per cent, which is not uncommon, the next step is to show the cause of this excessive waste of fuel; for it is quite possible to raise the efficiency of a boiler and furnace from 50 to 70 per cent, and greater improvements than this have been accomplished within the writer's experience.

IMPERFECT COMBUSTION.

The causes for poor boiler economy are numerous, but we may confine ourselves to a single form of waste, show how its cause is found and how the waste is stopped. For this purpose consider briefly the waste due to poor combustion.

Perfect combustion depends principally upon three requirements: (1) High temperature, (2) proper air supply and (3) mixture of the air with the fuel gases. Any one or all three of these things may be lacking, and they are all discovered in the boiler and furnace test by draught gauges, pyrometers and flue gas analyses.

IMPROPER CONSTRUCTION.

When low temperature is shown, the trouble probably lies in the design of the furnace or grates or the method of firing. Insufficient combustion space over the fuel bed is a common cause of low temperature and can often be corrected by lowering the grates or raising the arch. If the gases which flow from a bed of fuel are forced into immediate contact with a relatively cold surface, like the heating surface of a boiler, they are cooled down to a temperature below their natural ignition point, and therefore pass under the boiler and up the stack, just so much fuel wasted in the form of combustible gas. Improper firing will also cool a fire, as also will an excess of air, which in turn is frequently caused by blow holes due in turn to poor firing.

THE AIR SUPPLY.

The second cause for poor combustion, i. e., improper air supply, is accurately indicated by analysis of the flue gas, which shows the amount of free oxygen remaining after the combustion has taken place. It is therefore immediately known whether the fire is receiving too much or too little air. Now, a certain amount of air is necessary to burn, and get the heat from, the fuel; and if this is not supplied the fuel cannot be completely burned. On the other hand, if too much air is supplied, a part of the heat of the fuel goes to heat this excess of air up to the temperature of the fire, instead of going to make steam.

If too much air is supplied, the trouble can be corrected by regulating the draught, by deepening the bed of fuel on the grates, by reducing the percentage of draught area in the grates, by reducing the area of ducts which supply air to the combustion chamber or bridge-wall, by pointing up the brickwork of a leaky setting or furnace, by making all doors air-tight, by changing the design of the furnace to feed properly, etc.

If too little air is found, this may be corrected by the use of stronger draught, by keeping a lighter bed of fuel on the grates, by increasing the percentage of draught area in the grates, by a good system of air admission to the combustion chamber or by altering the design of the furnace to feed the fuel according to the requirements.

ANALYSIS OF FLUE GASES.

The third cause for poor combustion, i. e., imperfect mixture of the air with fuel gases, is also discovered by analysis of the flue gases. Thus, if the first two requirements for good combustion are met, that is, the temperature is high and the air supply is right, and the combustion is still poor, the analysis will then show that there is a quantity of unused fuel gas passing up the stack unburned, which forms a serious waste. This gas is capable of producing a large amount of steam when burned. It is known as carbon-monoxide, and it has not burned because it was not thoroughly mixed with the air (oxygen) necessary for its combustion. There are various ways to obtain the necessary mixing of the air and fuel gas. Large combustion space, both over the grates and under the boiler, is one of the simplest and best methods. By making the arch high or the grates low and the combustion chamber deep, the velocity of the gases is reduced, so that they remain for a longer time in contact with hot surfaces and the air supply. This allows the air and gases to mingle together thoroughly and the combustion is thus completed. There are other means for increasing this mixing action, such as checker-work of brick, baffles, and back or down draughts, which, generally speaking, are good, providing they are not so constructed as to impair the draught.

SCIENTIFIC FUEL SAVING.

The writer has now endeavored to describe in general terms a scientific system for tracing and stopping waste of fuel in a tannery plant, but has attempted to show in detail only the method relating to combustion losses, which form a subdivision of that part of the fuel problem dealing with the generation of steam. In actual practice the application of this system has resulted in fuel saving that has been as gratifying to the tanners, from a pecuniary standpoint, as to himself, as a matter of scientific interest and engineering practice.

LOSS OF HEAT IN THE LEACH HOUSE AND POOR LEACHING AS A RESULT.

By B. D. Westenfelder, Cincinnati, O.

The writer, under this caption, will endeavor to show in as simple a manner as possible one of the pregnant causes for poor leaching and also the waste of coal.

It is well known that bark or wood cannot be practically exhausted with either cold or only tolerably hot water.

The expression, "practically exhausted," is used advisedly and in the sense that only such matters as are really absorbed by the hide,

not stuffed in; and not all matters extractable by drastic leaching even were this possible in actual tannery practice.

EXPERIMENTS IN LEACHING.

The writer very much doubts, and in fact has carried out some careful experiments which very clearly show that the products of drastic leaching are not available to the extent which is usually assumed in heavy leather tannages, even after the weak liquors have been concentrated in vacuo; because these so-called woody matters are again thrown out of the liquors, that is, become insoluble on concentration to the point where they can be used for tanning. It is not yet proved that liquors made by boiling with steam in the leach yield more pounds of leather per ton of bark than those made by simply running hot water, say 200° Fahr., or somewhere near the boiling point, on the top of the bark in the leach.

Inasmuch as it has been pretty well established that a temperature of this degree is necessary, it is evident that a considerable drop in temperature between the heater and leach means not only a loss of efficiency, or poor leaching, but also a loss of coal. It is, therefore, perfectly clear to say that to heat a liquor or water up to 200° or more and let it cool from 40° to 60° either on its way to or in the leach, is a waste of time and money. These conditions, nevertheless, do obtain in many leach houses and similar ones elsewhere in the plant, and considering the present state of affairs and this age of economy, it is all the more astonishing that it should be so.

Tanners of heavy leathers, principally sole leather, being the largest consumers of bark, use comparatively little power. The amount of coal consumed is, nevertheless, quite an item. The question is, where is the steam used, if not for power? As very little of it is used directly for heating buildings, this being done by exhaust steam, the answer is apparent.

It takes a surprisingly large amount of heat (steam) to heat water from an initial temperature of 60° Fahr. up to or near its boiling point. It will, no doubt, be interesting to show the amount of steam which is required to raise say 1,000 gallons of water (8,333 pounds) from 60° to 200° Fahr. To raise the temperature of one pound of water one (1) degree Fahr. requires one (1) heat unit; to raise the temperature two (2) degrees requires two (2) heat units, etc. As we are to raise the water from 60° to 200°, there will be required for one (1) pound of water 140 heat units (200°—60°=140°) and for 1,000 gallons, 1,166,620 heat units (8,333×140=1,166,620).

We will assume a boiler pressure of steam to be such that it is delivered at the heater at 90 pounds pressure. Steam at this pressure has about 1,000 available heat units.

STEAM REQUIREMENTS.

It is now a simple matter to calculate the required amount of steam and is as follows: 1,166,620÷1,000=1,166 pounds of steam, and allowing 30 pounds per hour as equivalent to a horse power, and it has taken one hour to do the heating, it is apparent, that in order to do the heating within this time, requires us to have (1,166÷30) a 38.8 horse power boiler capacity.

Should it be required to do the heating in one-fourth of this time, a boiler of four times the capacity or (38.8×4) about 155 horse power is necessary. It will, no doubt, be remarked by the majority who read this article that "we know this from experience." Be it so: but why do the conditions set forth in this article continue day after day and year in and year out? It should be said, at this stage, that one pound of steam at a pressure of 90 pounds will give out about 1,000 heat units, in condensing into water at 212° Fahr., and 82 units more in cooling to 130°, which is the average temperature of the water in the heater, viz.,

$$\frac{200+60}{2}=130^\circ.$$

These and other refinements are to be taken into consideration when working under the most favorable conditions, but as these do not obtain in the average manufacturing plant, the results are practically correct.

CALORIMETRIC DETERMINATIONS OF COAL

indicate as a rule, that 50 per cent and more water should be evaporated than is done under the usual conditions. It may seem rather startling to some, but the writer feels safe in saying that not over six pounds of water, as a whole average, are evaporated by one pound of coal. Boiler test, under ideal test conditions and when everything is just so, shows no doubt ten pounds and over; but these conditions and results do not obtain in every day runs, year in and out. It should, however, be stated that this is no fault of boiler construction, and also that all boilers, be they fire or water tube, give about the same efficiency under ideal test conditions, notwithstanding any claims to the contrary. These results were, of course, not obtained by boiler men or anyone particularly interested in any one boiler, but by those who were after facts. The question of superiority in construction, safety, rate of steaming, etc., does not concern this point.

Taking six pounds of water per pound of coal and having shown that 1,166 pounds of steam at gauge pressure of 90 pounds are required to heat 1,000 gallons of water from 60° to 200° Fahr., it becomes a very simple matter to calculate and find that 194⅓ pounds of coal are required to do this (1,166÷6=194⅓).

The average temperature of water or liquor as it leaves the average heater is about 200 degrees Fahr., any variation being due to difference of altitude, other things being equal.

OPEN LEACHES.

It is quite a common practice to have uncovered leaches, that is, open at top, and although the water leaves the heater at 200° and may even run into the leach at this temperature, it is immediately cooled from 40° to 60° (140°—160°) or even lower, depending, of course, upon the season of the year and other surroundings, as the case may be. If the process of leaching is permitted to go on at these reduced temperatures, it means one thing, and that is reduced leaching efficiency. If, on the other hand, the heat is again brought up in the leach by steaming, it means that the efficiency is brought back, but more coal had to be used under the boilers. The writer will show how much coal is necessary, or rather lost, to put it in another way, when 1,000 gallons of liquid are allowed to cool from 200° to 140° Fahr.

As this is a loss of 60° Fahr., it means a loss of 60 heat units per pound of water and for 1,000 gallons there will be a loss of 8,333×60=499,980 heat units. The amount of steam lost, as it were, is equivalent to (499,980÷1,000=499.98) 500 pounds, and this means 500÷6=83⅓ pounds of coal; quite an amount, and this is for only 1,000 gallons of liquid, a small volume from a tanner's or extract maker's standpoint.

Finally, this is only taking into account the loss occurring during running conditions. But inasmuch as the leach house lays idle (in a tannery) during the night, the liquors cool off much more and the loss is proportionately increased, and what is of even greater importance, the leaching efficiency is very materially reduced. If, on the other hand, the heat is kept up in the leach by steaming during the night, the loss of coal, as it were, occurs just the same when leaches are not covered.

HEAT LOSS BY RADIATION AND EVAPORATION.

That liquids will cool off when the supply of heat ceases, and also that liquids continue to lose heat when supply remains constant, is nothing new, but the manner in which this takes place is not so well known to the average individual. Let it be said that liquids lose heat by radiation and evaporation. By the latter is meant not that heat evaporates like a material body; but heat being a form of energy is carried off as such in the watery vapor. In fact, the greater part of the heat which disappears does so in this manner; the heat lost in the other manner being a relatively small one. Knowing these facts it is not at all astonishing to learn that the loss is so great and rapid and especially when one considers the area of exposed surface of a leach.

Leaches are all the way from 10 to 15 feet in diameter and expose a surface of from 78.54 to 176.71 square feet; and let it be said that one of the most efficient and satisfactory methods of cooling hot water for an ice or steam plant is by exposing the water in a divided state, brought about by a system of screens, to the air, or in a so-called Gradir Tower. The water is not only cooled down to air temperature, but sometimes as much as 15° below, depending, of course, on the relative humidity of the air, other conditions being equal.

Does it not suggest of itself to have the leaches covered? And this not only to retain the heat, etc., but to make the leach house a place where it is safe to move around in, which is not the case when tops remain uncovered.

The first cost and so-called inconvenience should not only be considered, even were they many times greater than they are, because the loss of coal and efficiency in leaching more than offset these, as they are going on from day to day and year in and year out.

ELECTRIC MOTOR DRIVE IN TANNERIES.

The exigencies of modern industrial work have produced a variety of conditions so new and so unusual that old-time manufacturing operations cannot succeed with the measure which ought to be secured, because of the expenditure of time, labor and power.

The time was when every tanner was content to make the profits which were possible by the use of line shaft drive for his various production machines.

Nowadays, with labor and raw material far higher than in the olden times, the tanner must necessarily adopt newer methods, in order to make legitimate profits. Electric motor drive makes it possible to get greater profits by reducing the cost of fuel and by increasing output, because of the great convenience of motor drive.

LOSS BY BELT DRIVE.

Every tanner is familiar with the belt system of tannery operation whereby power is generated by steam engines and transmitted throughout the plant to the different buildings and departments by means of line shaft and belting, or line shaft and ropes. The method is efficient for short transmissions. However, tanneries are generally spread over great areas and the losses of power in belted operation are directly proportioned to the distance to which power is transmitted. Every foot of line shaft, every belt and every hanger increases the loss of power. This would not be the case if it were possible to attain mechanical perfection in the arrangement of the transmission machinery by supplying absolutely rigid, well lubricated and liberal bearings, line shaft of

such diameter as will not spring and belts which will not stretch, slip or break. Ideal conditions cannot be attained in this manner and thus it is that tannery operation by means of belt and line shaft entails losses of power varying from 30 per cent to 75 per cent, depending upon conditions.

It is disheartening to contemplate the great losses of power in its transmission by line shaft and belting. It frequently means that over half the coal fed to the fires never does any effective, profitable work. The power generated by the use of the coal is expended in reaching the machines to be operated.

ECONOMY OF MOTOR DRIVE.

Under electric motor drive for tanneries, the driven machines are operated by electric motors which derive their current from a central power station through small wires. The transmission system is very simple and the different departments are supplied with power and lighting current without appreciable loss. Instead of requiring heavy mill structures to support the transmission devices as is necessary where belted operation is used, the motor driven tanneries can be built with far lighter structural members, because there is no twisting effect due to line shaft operation. The walls and ceiling supporting electric wires need only be strong enough to sustain the weight of the wires. This weight is, of course, far less than that of line shafting capable of transmitting equal amounts of power.

LOCATION OF ELECTRIC POWER PLANT.

In electrically driven tanneries, the power plant is located at some convenient point. The position of the power plant is determined purely by the conveniences of operation. The power plant can be located, if desired, near the coal docks, or railroad tracks, in order to effect a minimum handling of fuel and ashes. Electric power can be transmitted to any distance necessary in tannery work, and thus it is not necessary to figure on placing the power plant in a central position with regard to the various buildings comprising the tannery. This is frequently necessary in operating tanneries by line shafting and belting, requiring at times that the power plant be located in very inconvenient positions and increasing greatly the cost of supplying the plant with fuel and of carrying away the ashes.

Conditions determine whether the power plant should be equipped with but one large engine and dynamo, or to divide the power equipment into several units, thus making it possible to provide for the convenient operation of the plant over-time without necessitating that the main or large power equipment be operated when it is necessary to drive a few machines or departments after regular working hours. Modern practice calls for the direct connection of the engine to the

dynamo, although this is not necessary. The advantages gained are compactness of power plant—saving much floor space, which is frequently very valuable—securing positive operation and complete immunity from troubles due to belt slippage and breakage.

DISTRIBUTION OF CURRENT.

The current generated in the power plant is carried to a switchboard located in the power plant, which serves to distribute the power to the different buildings or departments. If desired, the switchboard can be equipped with accurate measuring instruments which can record the consumption of power of the plant throughout the entire day and aid the owner in determining upon his costs for fuel. Such record is also frequently valuable in determining the habit of the plant—whether all machines are started promptly at full load at the beginning of work, or if the full load does not come on until some considerable time after all of the men are supposed to be at work.

From the switchboard, wires conduct the electric power and lighting current to the various departments in the plant. The wires can be likened to the trunk of a tree and its branches. In the ordinary tannery, a trunk power circuit traverses the plant. Branches lead from the main circuit to the various machines to be driven electrically. It is easy to arrange for extensions to the wiring service, as no alteration in the structure is required to support the wires. They can be fastened to the walls, or ceilings, etc.

MOTORS ATTACHED TO MACHINES.

Motor drive, as applied in tanneries, includes the installation of motors under a variety of conditions. Assuming that the tannery is to be equipped with entirely new machinery, it will be best in most cases to place the motor directly on the driven machine. This secures great convenience of operation of the driven machine, for it is self-contained and thus can be operated immediately upon being set on its foundation. The motors can be direct connected to the main shaft of the machine, geared to it, or connected by flexible coupling. Frequently it is desirable to use silent chain drives, working on the principle of the bicycle chain and sprocket, although of different mechanical construction, to enable them to stand the speeds of the service and the power to be transmitted. The method of application is determined by the engineer and the manufacturer of the tanning machinery. In all events, the convenience of operation should be held uppermost in mind, as some slight alteration in the driven machines to accommodate the motor may make it possible for the machine hand to secure greatly increased output. It is not well to stake the cost of a few dollars' special work on the driven machine against the convenience of the workman, if this convenience increases the daily output.

Motors can be built to operate in any required position, even with the shaft vertical or at any angle from horizontal to perpendicular. Thus the flexibility of application of motors makes it possible to place them on the machines, above or below it, etc.

THE GROUP DRIVE.

Under some conditions where light machines are used, group drive is employed. This is frequently the case where a small department employing light machines does not require that all of the machinery be operated at one time. For such work a short line shaft is installed and the driven machines belted from the line shaft. A motor drives this line shaft, taking its currents from the nearest shop power circuit. By the use of short drives of this nature, the disadvantages of line shaft operation are done away with, because of the short distance of transmission.

HIGH EFFICIENCY.

Electric transmission system is economical from dynamo to driven machine because of the high efficiency of electric transmission systems. The losses vary from 10 per cent to 25 per cent, depending on the conditions prevailing in the work. This means that less fuel is required to accomplish a given output. It is frequently possible to install motor drive in existing tanneries, arrange the machines for electrical operation, employ the old engines and boilers to drive the dynamos and keep up the old rate of output with 50 per cent less coal.

Aside from the high economy of electric transmission system, there is another feature which tends to reduce operating costs by increasing output. This makes it possible for the workman to do more and better work, enabling the tannery owner to increase his daily output, or to maintain his output by the employment of less labor.

CONVENIENCE AND FACILITY.

The convenience of electric motor drive falls under three heads. First comes the convenience of original installation, which means that the excessive cost of line shafting, hangers, belts, countershafts, etc., is done away with. The cost of electric wire and of placing it in position to transmit current is merely nominal as compared with belt and line shaft transmission. In arranging the tannery for electrical operation, the various machines to be driven are placed where most convenient—where light is best—or in the best location with reference to cycles of completion of worked material. This makes it possible to arrange the machines so as to reduce the amount of handling between machines to a minimum. This frequently saves much floor space, as well as time and labor. The convenience of arrangement of motor driven machines continues throughout the life of the plant. It very

seldom occurs that the successful tannery can be so laid out that the machines employed can be retained in one position throughout the growth of the plant, with its natural increase in size. The belt driven tannery is restricted in growth, but two things are possible. The old arrangement must continue throughout the life of the industry, or if it is desired to change the arrangement, it is necessary to make extensive and expensive alterations in the line shafts, etc.

Electric motor drive takes good care of growing tanneries. Machines can be set wherever convenient and established without regard to the transmission system. If the motor driven machine has been located, the power is brought to it. There need be no consideration of distance from power house or nearest available shaft, as is the case under mechanical transmission. Individual motor driven machines are self-contained and, if desired, can be moved, leveled up on their new foundations and operated as quickly as is possible for the moving to be accomplished.

IMPORTANCE OF SPEED CONTROL.

Convenience of speed control is an important factor in increasing output. The great railroads of the country have most fully appreciated the advantages of variable speed drive for their shop equipments by arranging the machines to operate at different speeds to suit the conditions of work. The tanner will secure increased and bettered output. Instead of compelling his workmen to shift belting on counter shaft to change the speeds of his machines he enables them to change their speeds by moving a small lever, which can be placed at any convenient point, even though at a distance from the motor and machine. By making speed control convenient the tannery owner gives an incentive to his men for good work.

The ability to control motor driven machines from a distance is an important factor in securing convenience of operation in tanneries. Pumps, blowers, fans, etc., can be located in out of the way or distant places and started or stopped from the most convenient point. They do not require constant attention. Occasional inspection and lubrication are all that is necessary to secure good results.

MOTOR DRIVES FOR PUMPS.

Motor drive for isolated machines, such as pumps, ventilating fans, blowers, hoists, elevator mechanisms, etc., affords great economy of operation. To operate the ordinary steam pump or fan requires an extensive system of steam piping from the boilers. It is difficult to transmit steam conveniently and satisfactorily to any distance, owing to the condensation and leakage. Motor drive saves all of the piping and power loss, because the motor driven machines can be situated at any required distance from the power plant and operated economically.

It frequently happens that because of the ease and economy of electrical operation it is possible to accomplish by power work that has been formerly done by hand labor at great expense and loss of time.

ELECTRIC LIGHTING.

An important consideration in deciding upon the installation of electric transmission machines in tanneries is the convenience and safety of electric lighting. By installing electric lights in the tannery the men are able to turn out good work at all times, whether the days be dark or bright, whether the machines are located in some spot near windows or placed far away from outside walls in dingy corners.

Motor drive saves money by saving power. It saves labor costs by making the tannery workmen able to turn out more product or by enabling a smaller number of men to accomplish the same results as were attained when the plant was operated by belt and line shaft. Electric motor drive saves time because it reduces the time required for the workmen to accomplish their task by the convenient arrangement of machines and their convenient operation.

INCREASED OUTPUT.

An instance of increased output secured by motor drive is cited by a representative western tanner. After equipping a belt knife leather splitter with an electric motor he was able to split more leather than with three splitters operated in the old way. Owing to the uniformity of cutting the motor driven machine affords a remarkably smooth top finish to the stock and enables a much thinner split to be made. The absence of slippage, due to heavy cuts or tough spots in the leather, makes the product free from imperfections due to slippage of belt.

Motor drive can be so applied in tanning work that the tan drums, for instance, can be automatically reversed. This can be accomplished by equipping each set of drums with a motor and special controlling device, so that the direction of rotation of the drums will be changed automatically at predetermined intervals.

USING OLD POWER PLANTS.

While electric motor drive can be applied most advantageously in new plants equipped with new machines yet there is every opportunity for the tanner with an existing plant to arrange his works for electrical equipment, thus employing his old boilers, engines and production machines without any increased expenditure in those lines. Thus the tanner can install a dynamo in his engine room, drive it by belt from his engine, wire the plant for electric transmission and apply motors to the different machines. With proper planning the transformation of the plant from belt drive to electrical operation can be accomplished

gradually and without any material interference with the work of the tannery.

EXPERT INSTALLATION.

In considering the application of motor drives in tanning work it is best to call in engineers who have had experience both in the tanning line and in the electrical line. The engineer best suited to assist on the application of motor drives is one who is thoroughly acquainted with the various machines used and the conditions under which they operate. To this knowledge he must add familiarity with electrical machines and possibilities and the best means of applying them. Poor engineering in installing electric motor drive is apt to cost a pretty penny without giving the tanner the benefit of reducing the operating costs and increasing the output to which his investment entitles him.

THOROUGH KNOWLEDGE NECESSARY.

An instance was recently noted where an electrical manufacturer undertook the equipment of a plant for motor drive without being thoroughly familiar with the conditions of tannery work. This particular manufacturer had made numerous applications of motor drives in machine shops and worked out the tannery proposition along similar lines. In one instance he employed a belt driven equipment in a damp, sloppy part of the tannery and as a result the driven machine—which carried heavy loads—was subjected to the same old difficulties of belt slippage which had been an important factor in reducing its capacity when operated by the line shaft from the engine. In this instance the only economy attained was the saving in power between the engine and the machine. A skilled engineer would have gone one step farther and driven the machine by direct, coupled or geared drive, thus getting positive operation. To have accomplished this would require a waterproof motor. Certain of the electrical manufacturers are prepared to supply such equipments and the waterproof motor could have been applied had the manufacturer realized the necessity and been able to supply the machine suited to the work.

THE TANNERY BOOKKEEPER.

Every industry, no matter how small, is divided into three departments. First, the manufacturer, the man who makes the goods; second, the salesman, the man who markets the goods which the manufacturer makes; and third, the accountant, who looks after, audits and classifies the accounts, doings and results of the manufacturer and salesman. Each is interdependent upon the other and neither can proceed without the other. The manufacturer can manufacture till doomsday, but without a salesman to sell the results of his manufacture

are nil. The salesman must have behind him the goods, without which he is of no economic value whatever, and the accountant, though the last in importance, is so much of a factor that he is absolutely essential to the progress of both the manufacturer and the salesman. While the accountant is not, like his colleague, a creative power, he is, if the proper kind, a vast saving power and by careful thought and management his opportunities for gathering in the loose ends are such that the net profits of his firm are very materially increased by his efforts. It is, then, a proven fact that the accountant or "bookkeeper" has a work to accomplish and an important one, too, and it all remains with him as to how much value he can make himself to his firm.

USE LABOR-SAVING METHODS.

Being a disbeliever in all unnecessary labor, the writer is a strong advocate of all labor-saving devices and short cuts, and, whenever practical, would favor their introduction into the tannery office. Another pet hobby is, as complete a record as possible of every transaction, shipment and purchase. For instance, in tanneries somewhat distant from the market centers there is a constant ordering of supplies, machinery parts and so forth, and the ordering of such parts and supplies is wont to fall to the lot of the "bookkeeper" after he has received the order verbally from a foreman, engineer or whoever it is that is in need of the article or articles. Any mistake, therefore, in the shipping of any of these dozen and one things ordered almost daily is laid at the door of the poor "bookkeeper." A very good way around this difficulty is to provide small pads and insist upon the foreman, engineer or whoever it may be that is really doing the ordering, to write upon the pad just what he wants and sign his name to it. All this may seem a sort of useless fol-der-ol, but it really takes no longer and the satisfaction that you get when a foreman orders bicarbonate of soda when he really wants carbonate of soda, certainly pays for all the extra trouble this method has made you, for without this simple protection the foreman would surely have insisted that "he told the bookkeeper right but the bookkeeper made a mistake." The use of these order pads is, of course, really of more benefit to the bookkeeper individually than to the firm, for he is the one who is protected by them, but they are also not without usefulness to the firm itself, for they certainly eliminate mistakes and make all parties more careful. When everything can be conveniently charged up against the bookkeeper, every one from the proprietor down is sure to be more careless than when the errors are likely to be laid at his own feet.

KEEP COMPLETE RECORDS.

As before stated, the writer is a great advocate of a complete record of everything. In this the use of the carbon paper plays an important

part. Shipping receipt books, with a tissue copy for the customer, an original for the freight agent and a duplicate for the shipper and duplicating invoice books are so well known that a description would be superfluous.

In this connection a word about the copying of letters and the filing of correspondence would, perhaps, not be amiss. Where a machine is used, I see no advantage whatever in the use of the old-fashioned letter book, and the letter copying book certainly takes twice the time of a carbon copy, so why not the carbon copy universally? The argument against it, I know, is that it is not good, or not so good in law. In answer to this, in the first place not more than one letter in five thousand ever gets into court, and in the next place, if a carbon copy of a letter does have to be used legally, why is it not good? If a record on a block of wood has been used as conclusive evidence in the courtroom, and it has been, on what grounds can a jury object to a good, clean carbon copy?

VERTICAL FILE RECOMMENDED.

The letter book to my mind is a nuisance, an inconvenience not to be endured, when by providing a good vertical file with a sufficient supply of transfer cases, a complete record covering a generation's time of business can be kept in a clean, compact and convenient form, by the use of the carbon paper and the abandonment of the letter book, and in a manner so that any certain bunch of correspondence can be turned in an instant's time.

HIDE CLAIMS NEED CAREFUL HANDLING.

Most of the above would apply in a general way to any class of business as well as to the tanning industry. Coming now to the tannery specifically, there is a field where the tannery bookkeeper can make his entire salary, unless his salary is larger by far than his brother bookkeepers are accustomed to receive, and that is—hide claims. Hide claims are a nuisance, to be sure, especially to the dealer, and the dealer does not like to pay them, and for this feeling we, of course, cannot blame him. Nevertheless, it is a rare car of hides that is perfect, and no matter what the conditions may be, there are bound to be more or less hides enter a tannery on which there is or should be a claim made, and unless the dealer is heavenly honest or carefully reminded of the unsettled claims, they are in many instances apt to become moss-covered and forgotten.

A SIMPLE PRINTED FORM.

A simple printed form to fit a loose-leafed cover, with a carbon copy arrangement and a simple follow up system, will produce results which

would astonish one who has been accustomed to make the hide-claims "any old way" and trusting to his memory or the back pages of his ledger as to when they were paid and how much they were discounted.

When a claim is made and made fairly, there is absolutely no reason why it should not be settled in full like any other debt, but they will not be unless they are handled in the office of the tannery in a businesslike and systematic manner.

Care should be taken in the first place that the claim is not too "stiff." Have it so that you can stand behind it with as much of a feeling of security as you have concerning your marriage certificate and then go ahead. Get it. Much better is this than first making the claim "plenty large enough," not feeling just sure about it, wilting, and accepting one-half or one-quarter of the original amount.

WATCH THE "FIGURING LOTS."

Another phase of tannery records, whose advisability is sometimes questioned as to whether or not the information obtained is of enough value to pay for the amount of work and energy expended, is the figuring and recording of yields and grades, or what is commonly known as "figuring lots." If at the sorting table, a lot book and shipment book have to be kept separately to obtain the data for this figuring, it is a question, but if, as is generally the case, this data can all be obtained from the book of shipments, it is like throwing facts away, if a record is not kept of the yields of the different cars of hides. Especially is this true of chrome leather, for oftentimes, in this treacherous class of stock, a falling off in the yield means the detection of some fault in manufacture.

STAMPING MACHINE FAVORED.

The first requisite of a successful "lot record" is a satisfactory method of stamping the new hides. This can be done by punch marks or by hand stamps with either letters or figures, but neither of these methods are as good as the stamping machine, which not only saves time but produces a much clearer impression. After a satisfactory stamp has been found it is an easy matter for the shipper to so indicate on his shipping book the division of the different cars of hides that the yield and percentage of number one, two and three leather can be readily figured, the results of which should be entered in a book kept for that purpose. Continue this practice for a year and you will have a list of statistics that your people wouldn't take a good deal of money for; continue it for two years and you will have something which your house will consider invaluable. Aside from the advantages of the practice, you will find it, indeed, a most interesting occupation.

USE THE SHORT CUTS.

Finally, let me repeat, you are in a position to make yourself as important to the firm by which you are employed as either of your friends, the manufacturer or the salesman. Do your work well, but do it by the easiest possible method which does not interfere with its well doing. Use all the short cuts possible, never make two marks when one will do quite as well and any extra time you gain hereby don't idle, but "butt in" to something within the factory, remembering the more you know about tannery workings, the more you know about tannery bookkeeping.

FAHRENHEIT AND CENTIGRADE.

As in science degrees of heat are invariably given according to the centigrade thermometer, the following table will be of value to our readers. To convert these into Fahrenheit the following simple rule should be remembered. Multiply the number of C. degrees by 9-5, and add 32 in each case. To convert F. into C., subtract 32, and multiply by 5-9.

EQUIVALENTS IN C. AND F.

C. Deg.	F. Deg.	C. Deg.	F. Deg.
.6	21.2	21	69.8
.5	23.0	22	71.6
.4	24.8	23	73.4
.3	26.6	24	75.2
.2	28.4	25	77.0
.1	30.2	26	78.8
.0	32.0	27	86.6
1	33.8	28	82.4
2	35.6	29	84.2
3	37.4	30	86.0
4	39.2	31	87.8
5	41.0	32	89.6
6	42.8	33	91.4
7	44.6	34	93.2
8	46.4	35	95.0
9	48.2	36	96.8
10	50.0	37	98.6
11	51.8	38	100.4
12	53.6	39	102.2
13	55.4	40	104.0
14	57.2	41	105.8
15	59.0	42	107.6
16	60.8	43	109.4
17	62.6	44	111.2
18	64.4	45	113.0
19	66.2	46	114.8
20	68.0	47	116.6

Deg. C.	F. Deg.	C. Deg.	Deg. F.
48	118.4	75	167.0
49	120.2	76	168.8
50	122.0	77	170.6
51	123.8	78	172.4
52	125.6	79	174.2
53	127.4	80	176.0
54	129.2	81	177.8
55	131.0	82	179.6
56	132.8	83	181.4
57	134.6	84	183.2
58	136.4	85	185.0
59	138.2	86	186.8
60	140.0	87	188.6
61	141.8	88	190.4
62	143.6	89	192.2
63	145.4	90	194.0
64	147.2	91	195.8
65	149.0	92	197.6
66	150.8	93	199.4
67	152.6	94	201.2
68	154.4	95	203.0
69	156.2	96	204.8
70	158.0	97	206.6
71	159.8	98	208.4
72	161.6	99	210.2
73	163.4	100	212.0
74	165.2		

DRYING LEATHER BY THE HOT BLAST SYSTEM.

The one feature most essential to a successful system of drying leather is a positive and continuous circulation of fresh air. Second only to this in importance is the maintenance of a uniform temperature throughout all parts of the drying room. For meeting the first condition only mechanical means in the shape of a fan blower can be relied upon to operate without variation under all changes in the weather. Local overheating, which is bound to result with a system of direct steam piping, can only be avoided by the introduction of an indirect system under which the coils are massed at one or more points outside the drying room. The amount of surface so required will be large and the heaters necessarily scattered if natural means are relied upon to produce circulation of air; but when a fan is employed it is possible to greatly reduce the surface required and mass it at a single point where the air may be forced across it at high velocity, thereby greatly increasing the condensation and giving the maximum efficiency to each square foot of surface.

HOT BLAST DRYING SYSTEM.

As ordinarily designed for the best service a hot blast drying system comprises a steel plate fan-blower driven by a direct-connected engine so that it may run at any time, day or night, independently of other sources of power transmission, and two heaters made up of cast iron sections into which 1-inch pipes are closely screwed. Through these pipes the steam circulates, and from a group of sections the water of condensation is readily trapped. Either live or exhaust steam may be used in the heater. The exhaust of the fan engine is always utilized in this way, thereby reducing to practically nothing the cost of driving the fan, which may be operated at any speed to meet any desired conditions. The variety in temperatures required in the various rooms has led to a special design of apparatus, particularly applicable to the drying of fancy leather, which is so arranged that either warm or cool air, or a mixture of the two, at any desired temperature, may be delivered to any given floor. The heaters are arranged in two groups. The first, with which the air comes in contact, is placed at the inlet of the fan and merely serves to temper the air so that its temperature when discharged by the fan may never be less than about 60 degrees. The main heater is so placed in conjunction with the fan that air is either forced through it or passed above it. Under the first condition the air passes to the building at its maximum temperature. Under the second it receives no heat in addition to that imparted by the tempering coil.

APPARATUS IN BASEMENT.

In the general arrangement of a well-designed leather drying plant, the apparatus for regulating the circulation of the air in the first and second floors is located in the basement, adjacent to the bank of three vertical brick flues. Into one of these hot air is forced, to the second tempered air is delivered, while the third serves as a return flue through which air which is still warm, but not over moist, is returned from the rooms above. This condition obtains in rooms in which the drying process is nearly completed. Along the ceiling of each floor extends a system of hot air piping with drop pipes at each of the columns. The air is discharged close down to the floor and there spreads out in even volume, whence it arises in the spaces between the hides, absorbing at the same time large quantities of moisture. Thorough distribution is thus secured, and discoloration which would result from blowing directly on to the leather is avoided. Outlet registers located in wall flues are so arranged that air may escape through them from the rooms and be discharged above the roof. In such rooms as contain but little moisture these vent registers may be practically closed and the air drawn back by the suction of the fan through the vertical return duct, whence it will pass through the tempering coil in conjunction with fresh air from out of doors and complete the circuit by being

drawn through the fan blower and forced through the heater and thence through the flues. On each floor is arranged a by-pass connection from the tempered air flue to the hot air pipe after it leaves the hot air flue. By an arrangement of dampers it is possible to make a mixture of the hot and tempered air at any desired temperature, distribute it through the openings to the room, and by further manipulation of dampers to absolutely control the amount of air and consequently the rate of air change and of drying within the individual room.

ARRANGEMENT OF FLOORS.

The complete arrangements thus described make possible the maintenance of radically different conditions on the various floors, each suited to the exact requirements of the material contained therein.

Of course the arrangement and control of the system will depend primarily upon the character of the output of the plant, but in the one described above it is customary to handle the heavy grease leather in the basement with moderate circulation of air and normal temperature. The first and possibly the second floor may be devoted to finishing and blackening, where a temperature running up to 80 degrees with a more frequent air change may be maintained. A still more rapid air change, but with a lower temperature, would be employed for middle drying on the floor above, while the upper floors would be devoted entirely to heavy drying with a very rapid air change and a temperature running from 60 to 80 degrees. Such arrangements may be readily altered to suit other conditions.

ADJUSTMENT OF AIR VOLUME MUST BE CAREFULLY STUDIED.

The adjustment of air volume and temperature must be carefully studied for each grade of leather, and manifestly the rooms must be kept absolutely dark where there is any objection to discoloration.

In the present marked advance in improved methods of equipment and management in tanneries and leather-working plants this improved method of drying is bound to play a most important part. Not only is it possible by its introduction to materially reduce the time of proper drying, but it possesses the faculty of drying evenly and thoroughly and of leaving the stock bright and mellow.

TANNERY STOCK-TAKING.

The question of tannery inventory is very interesting, but is not an over-pleasant job. Fortunately it is seldom necessary more than twice a year.

An up-to-date man should run his stock in lots. When his stock is received in the hide cellar, he puts it into lots, and on each car or so

he puts a special stamp. A record of this is kept in his office. As this stock is worked into the beam house, the lot is kept entirely by itself. It goes through the yard and the shop, and the same is done there. Isolation is the watchword clear through to the shipping room. If the tanner has been careful he now has a valuable record of finished leather, finished splits and offal, and knows just what he gets from this special lot, and whether he has made or lost on it.

TAKE HIDE HOUSE FIRST.

In regard to inventory take the hide house first. The tanner knows what his stock has cost there, because he has lot numbers to go by. Same in the beam house, yard, and shop.

Of course, he has his tannery reports as a guide. These should show amount of stock received and sent to the beam house; beam house to yard; yard to shop; and from shop to shipping room. And he has his balances in each department each week. In final figuring he has his actual cost, which should correspond with the balances in the weekly reports. Then he estimates materials on hand, bark, greases, oils, etc.

The tanner knows he has so many leaches, and how many cords each one will hold. Take the leach house and deduct say 50 per cent off for exhausted bark, or in other words, figure your bark half exhausted in the leach house.

In the yard, of course, you know how many vats of liquor you get from each leach. If you get two, it is easy to figure just what these vats have cost you, and the modern way of taking liquors now is to weigh them in the yard with the barkometer. After this is done, average them.

TAKE STOCK IN PROCESS.

In getting at the different values of your stock in process, you are aware of how much liquor the different packs have had, and the price of advancing them thus far in regard to labor, etc. Same way in the shop. You have stock in the crust in grease, and in finished leather, and you know just what each step cost you. Under proper management it ought to be no trouble to take stock when in operation.

SUGGESTIONS TO TANNERY SUPERINTENDENTS.

While things are running smoothly, with actual and prospective business in good shape, is a very good time for employers or superintendents to get and keep in touch with their help, seeing that they are treated fairly by the foreman, thus preventing future friction and discontent, which often comes as a surprise to certain superintendents who devote more time to the office end of their positions than to the actual work in the tannery and currying shop.

SLIGHTING THE WORK.

I have in mind a recent experience in one of the largest calfskin tanneries in the country, says a practical man. A dozen men were graining skins on piece work. The price paid was so low that a man had to be a very horse in swiftness and endurance to make a fair day's pay. Each man was provided with a slicker and told to use it on the flesh side to straighten out flanks and shanks after graining. This of course meant a great amount of extra work on their part.

There are certain workmen who never make the least objection when asked to do impossibilities. When told to use the slicker they will take it up and make a bluff of using it, and the moment the foreman's back is turned the slicker is laid aside until such time as he may come that way again, when the bluff is repeated. Such workmen have been made what they are by just such treatment; they have reduced to a science the art of slighting their work, or giving it the "high-low," as the boys say.

On the other hand, you may find a man who takes exception to what his superior says, who tells him that his opinion of graining skins is not in accordance with the price paid for doing the work, and will state squarely that he will not do this extra work without being paid extra for it. The foreman may lose his temper and send the man to the office, or allow him to quit right then and there.

This is dead wrong. The man is upright and square and protests against doing something he knows he can't do, and that the other workmen are not doing. The other fellows are not honest and are simply fooling their boss.

INVESTIGATE METHODS BEING EMPLOYED.

Every employer or superintendent should take time enough from the cares of salesroom and office to see that his workmen are not imposed upon, and that they are treated with the consideration due them as men and mechanics, and you may write it down as a fact that there will be less discontent and more satisfaction, which will of course mean a better class of work and increased capacity of the workman. This is always the case where things are pleasant for the men as distinguished from shops where they are treated badly.

TANNERY CALCULATIONS OF PROFIT AND LOSS.

The importance of the proper management of the calculating department does not seem deeply impressed on many leather manufacturers. The work is not simple; it requires a good practical knowledge. At first it does not seem remunerative and requires much time.

The necessity of calculating in all branches of the work in a tannery must seem evident to everyone, for it is important to know how

much is being earned or lost at the different stages of manufacture. However, in this direction many continue to turn their back for assistance.

BEGIN AT HIDE HOUSE.

Calculation books should receive their first entries from the hide house. Here the work practically commences. All the hides purchased from the different dealers are entered in the calculating books by lots, each of which is numbered, and these lots may again be divided according to the size of the packs in which they are worked.

The cost of all labor, material, etc., must be charged separately to each lot and the value of the stock, as well as working expense, must be obtainable at every stage of the process.

AVERAGE COST MUST BE ASCERTAINED.

The cost of the material for each lot in the beam house and tan liquors is quite difficult to fix, therefore the average cost must be ascertained and charged accordingly. With day labor the average price per hide or lot is set, where for piecework the cost is easily ascertained.

Items must be carried showing the green and leather weight throughout the process of manufacture and naturally the books must be kept to comply with the nature of the stock produced. False weight in hides may be detected in this manner, and a full control of the product and work may be maintained. No detail must be omitted, the cost of chemicals, tanning materials, wages, power, freight, discounts, etc., must in turn be charged to each lot.

There are probably many methods for keeping books of calculation, but no matter which scheme is used, the books must readily show the condition and value of each lot, no matter what stage it is in, and managers and superintendents will find a reference to them their greatest assistance.

TANNERY SUGGESTIONS.

Every tanner knows that in the various processes through which he works his hides or skins there are many details that need to be carefully attended to if the finished leather is to be all that it should be. Those tanners who pay the most attention to details are the ones who make the best leather and are therefore the most successful. In the beamhouse, in the tannery and in the finishing room there are many chances to do some detail undone that will result in some defect appearing in the finished leather.

In this article some of the imperfections most frequently encountered in leather will be considered and practical suggestions given for

their prevention. Take, for instance, the grain of leather, such as chrome and combination tanned sides and calfskins, boarded, smooth-finished, etc. Frequently such leather is seen that has a rough or a coarse grain or a grain that is loose and that "pipes" considerably when it should be smooth, fine and firm.

IMPERFECTIONS IN THE GRAIN

are usually traceable to improper or unsuitable liming. A short, quick liming in fresh and fairly strong lime is one of the secrets of a smooth, firm grain. If sulphide of sodium is used it should be used in only small quantities, just enough to loosen the fine hairs, as too much sulphide is often the cause of a thick grain. The hides should be always well soaked, free of all salt, blood and dirt, and carefully fleshed before they are put into the limes, and too many hides should not be crowded into a vat, and the hides should be sorted and not limed with large and small, thin and heavy hides thrown in indiscriminately. The sides should be limed until the fine hairs can be easily removed, and as soon as this can be done the hides for firm leather are sufficiently limed, while for soft glove stock they may safely be limed a day or two longer. When small quantities of sulphide of sodium are added to the lime the grain is made very fine and firm, provided the liming is not carried too far, and when sides so treated are split out of the limes the grains finish up into much more satisfactory leather, and the splits are much heavier than when the sides are limed too long.

A greasy grain is sometimes caused by the sides or the skins having been insufficiently limed. Such stock is always the most difficult to tan, and when tanned it does not absorb and carry the grease as it should. A short quick liming is the only thing that will prevent loose, spongy sides and flanks, and leather that is too loose along the sides and in the flanks is the result of too much liming or of too much arsenic or sulphide of sodium in the lime.

THE PATENTED DEPILATORY CRYSTALS

that are used so successfully by wool-pullers are equally satisfactory when applied to hides and skins. Many tanners are not aware of this. A spongy or drawn grain on light skins is the result of too much liming or of too much sulphide of sodium or other depilatory, or is the result of too strong tanning liquors used at the beginning of the tanning process. When the grain of colored leather is cloudy or mottled it can generally be traced to salt left in the grain and not thoroughly soaked out, or to the skins not being worked out sufficiently before being tanned. When skins are rotten and weak, the cause is that they were not properly limed or were worked down too

low in the drench, especially if a bran drench was used. In order to get the grain perfectly clear the skins should be very thoroughly worked out of the bate or drench, in order that no lime, hair roots, etc., are left in to make the grain cloudy.

ADVISABLE TO PICKLE THE STOCK.

For some processes of tanning it is advisable to pickle the stock before tanning it. In place of sulphuric acid and salt being used for the purpose of pickling, formic acid may be used with good results. This article is quite new among tanners and has not yet come into general use. Experiments on sheep and goat skins have taught that formic acid can be used with safety in place of sulphuric acid. Whenever sulphuric acid is used it must be thoroughly washed out of the skins before they are dried out. Brittle, tender leather, that cracks and breaks at the slightest strain, is a common result of acid left in after pickling and not removed. A greasy grain and a white scum are other results of acid in the leather, which, coming into contact with the alkali in the fatliquor, causes a white scum or "spew" to appear upon the face of the finished leather.

WHEN SIDES ARE TO BE SPLIT

after pickling, it is better not to pickle them at all, as the pickling has the effect of making the grain loose. Calfskins and sides intended for chrome leather should not be pickled if a fine, firm grain is wanted; neither should they be pickled when a patent or an enamel finish is to be put on. The grain of enameled leather is wanted very fine and close, and the nearer it resembles coltskin the better it is liked. To get it just as it is wanted requires careful liming, with not too much arsenic or sulphide of sodium to coarsen or loosen the grain, and the pickling should be omitted. For fine grain red arsenic is better than sulphide of sodium. As soon as the fine hairs can be easily removed the sides are limed enough and should then be split and carefully bated or drenched, the grain worked out thoroughly and the grain then tanned in either the one or the two-bath chrome process. Instead of splitting the sides out of the limes they may be tanned in a one-bath process and then dried just enough to make them firm enough for splitting and shaving, and after this has been done they should be lightly retanned, washed and then fat liquored.

CARE IN ONE-BATH PROCESS.

Unless the one-bath chrome process is used in just the right way, and the sides or skins are in just the right condition, there are certain defects that are apt to appear in the tanned leather. When the tan liquor is used too strong the grain becomes drawn or puckered and the

skins shrink in size. Calfskins are more apt to become drawn than other skins, and sides that are tanned before they are split are also apt to show a puckered grain. The only way to avoid this is to use plenty of salt and to use a weak liquor at the start and gradually increase its strength. The grain frequently becomes drawn from the astringency of sulphate of alumina when this article is used as a preliminary tanning process. To get the grain down smooth again the leather, after setting out and oiling off, should be stretched out and tacked on boards and left thereon until it is perfectly dry, when, in most cases, the grain will be found to be smooth and firm.

TOO MUCH SALT INJURIOUS.

Spongy chrome leather is often caused by too much salt in the tanning liquor and too strong liquors. Some salt is, of course, necessary to help in the tanning, but too much is injurious to the solidity of the leather. Salt that contains impurities, such as lime and magnesia, has been known to cause a precipitation of the tanning liquor, rendering it unfit for use. When using a one-bath liquor, soft water must be used, as hard water causes the salts held in solution to be precipitated to the bottom of the vat or drum, and when this takes place the liquor must be thrown away. After heavy skins and sides have been tanned and split they should be retained in the drum to avoid any raw spots that will dry out hard and tinny. It is generally best to use a new liquor for the retanning and to wash the leather before shaving it. The skins can be partly tanned in a solution of sulphate of alumina and salt, dried a little, split or shaved and then tanned in the chrome process.

PREFER THE TWO-BATH PROCEESS.

Some tanners, who make fine glazed and enameled leather from sides and calfskins, prefer the two-bath process to the one-bath. They say that it gives a firmer and fuller piece of leather and makes the grain very fine. Every trace of sulphur and acid in the leather must be either thoroughly removed by washing or neutralized before the leather is dried out. If this is not done the varnish or lacquer will not adhere to the leather and will not dry properly. If the leather is degreased with naphtha the naphtha will remove the last trace of sulphur and acid, as well as cut out the grease.

DEFECTIVE COLORING

is often the result of improper preparation of the leather to take the dye. When the coloring is done in a drum the dye should be dissolved in boiling water, then boiled for a few minutes and strained through cheesecloth before it is put into the drum. The leather must be carefully prepared by washing, clearing and mordanting before

any color solution is given it. Vegetable tanned leather is improved by being run in a salt and alum solution for a few minutes immediately after the tanning is completed, then rinsed off and treated in the usual way. A good way to treat them is to wheel them in oil after the rinsing and then dry them out before giving them any fat liquor. The oftener and the harder leather is set out the firmer it will be and the smoother the grain will be. Sumac is useful as a mordant for vegetable, combination and chrome tanned leather. Sometimes colored leather dries out harsh and dry. Generally this is the result of a strong acid bleach having been used after the leather had been fat liquored. Much of the good effect of oiling and fat liquoring is lost or destroyed when the leather is bleached after fat liquoring, and for this reason it is better to do the bleaching before the fat liquoring.

DRYING.

After leather is set out and oiled off, it should be stretched and tacked on boards and left to dry out thereon. It is better if the leather is not dried too fast; if it is allowed to dry slowly it will be mellower when staked out. All the fine wrinkles in the leather come out in the drying and there is a slight gain in measurement when the leather is stretched out to dry. Some tanners prefer a mineral oil to neatsfoot oil for the purpose of oiling the grain, as it makes a dry foundation for the seasoning. Too much neatsfoot oil upon the grain prevents a clear, bright finish. After leather has been glazed it is well to wipe it over with an oily sponge; the oil serves to preserve the finish from moisture.

When the color of black leather is defective it can be much improved by applying a coat of black nigrosine liquor to the grain just before putting on the seasoning. Black nigrosine is also good to use in the seasoning and helps in getting a jet black finish.

LARGE VS. SMALL TANNERS.

There is a lot of talk among the small tanners, in relation to what is going to become of them. In speaking of small tanners, I have in view those who make from 300 to 500 sides and from 500 to 1,500 calfskins per day. Ten years ago they were considered large tanners. Now there are those who are making 800 to 2,000 sides per day, and one tanning firm are enlarging so as to turn out 4,500 sides of grains per day, besides the splits.

The question is, can a large tannery be run on as economical a basis as a medium-sized tannery, where the man who has his money invested is looking after the management of the business? A firm making, say, 500 sides per day, or 1,000 skins, can buy supplies in carload shipments, and can buy just as reasonably as the large tanner. Now,

if he can get his hides or skins at the same price as the large fellow, it is very difficult to see why the small tanner cannot make a much better showing when he balances up his books at the end of the season.

BETTER SHOWING FOR SMALL TANNER.

The reasons are numerous. The first is, most small tanners are practical. They know how to buy skins and hides; how to inspect them. They know how the work should be done. They can go through the works and see at a glance if the hides or skins are going through the different processes as they should go. If they find an "off" lot, it can be stopped and remedied at once, and the loss will be very small; while in a large tannery, if anything happens, the foreman of the department in which it occurs may see it and he may not—more often not—for he is there to drive the workmen, look after the work and draw his pay. Nine out of ten drive the workmen and draw their pay. If the work is done wrong, they blame it on some other department. For, as a rule, the trouble with the large tannery is that mistakes are never discovered until the leather is sorted, and then it is too late to definitely locate the trouble. All large tanneries have a superintendent, who, as a rule, knows when leather is finished right, but there are few who can look at a lot of leather that is "off" and can go and put their hands on the spot where the trouble occurred.

SUPERINTENDENT A VERY BUSY MAN.

Then, again, in the large tanneries the superintendent is usually a very busy man; he has all the buying to do, which takes considerable time. Hs is the "man with the big stick," and like the foreman, he is working for a salary, and is not apt to give as much attention to the business as a man who is working his own capital.

There are some very conscientious men filling the position of superintendent, and are as near right as it is possible for human nature to be right, but when a man has no capital invested, it takes a load from his shoulders.

The large tannery has a manager or superintendent who goes through the plant once a day. He does not know half of the employes, only the heads of each department, whom he speaks to as he is rushing through. The workmen do not stop to think he is a very busy man and has a limited amount of time, but they think he considers himself better than they, and is in a hurry to get out of their presence and does not want to speak to them, which is sometimes true.

BETTER WORK WHEN RECOGNIZED.

The man was never born who will not do more for his employer if he recognizes him only with a bow of the head or a wave of his hand. On the other hand, if the workmen get the idea into their

heads that their superintendent considers himself above them, they will never step out of their path to do him a good turn; if they saw anything going to the bad, they would close their eyes and inwardly chuckle. I do not mention this because I think the manager or superintendent of a plant should gossip with his employes, but it is a thing the large tanner is up against, and it goes a long way when you stop to figure the cost of having the good or ill will of your employes.

Now, take the large tanneries who have the purchasing agent. It takes that much off the superintendent's shoulders, but it puts a load equally as heavy on him in this way: The purchasing agent is supposed to buy his supplies as cheaply as he can, and he usually does buy cheap if you figure the first cost as cheap. But very often the materials are not just what the superintendent wanted, and he has to change his process in order to work up the goods. As a rule, the cheap materials are the most expensive before they are worked into the finished product. The purchasing agent is doing right as far as he is able to judge, but he does not know what the materials are for, and he will listen to some smooth-talking salesman, who will swear his goods are just as good as the kind they are paying more for, but they are not.

Take the small, experienced tanner, and he knows just what to buy. He knows just how to work his materials to get the best results. He knows all of his workmen. If he meets them on the street he speaks. If any of his employes shows the ability to push himself ahead, the employer notices it and gives him a better position, and the employe will be a loyal workman; and if he sees anything going wrong, he will make it his business to notify his employer.

BEST CHANCE TO WIN OUT.

Taking all the disadvantages the large tanner has to put up with, not mentioning the great loss when things do get away from him, and then remembering how close the small tanner is to everything, and I think I can safely say the small tanner has the best chance to win out. Considering the amount of capital he has invested, as compared with the large tanner, I can see no reason why the small tanner will not continue to do business profitably right along, and I look to see some of the large ones draw in their horns and do a much smaller and more conservative business.

CALFSKIN TANNERY LABOR.

In calfskin tanneries a careful system of computing the cost of labor is necessary. The profits are small and the tanner finds that he must know exactly what his leather is costing. In many departments, where the piece-work system is not used, a careful list is made out,

showing what constitutes a day's work for each operation through which the skins are put. The foreman of an eastern tannery says that in the beam house the following is a fair estimate of a day's work at unhairing:

Medium kip	150 skins per day
Heavy calf	175 skins per day
Medium calf	200 skins per day
Light calf	250 skins per day
Deacons	275 skins per day

On the fleshing machines three men will flesh out of the soaks a pack of 1,200 skins, and the same men will flesh from the bates 1,200 skins, and clean up the machinery and take up all fleshings.

In finishing wax calfskins, the following card is used, showing what constitutes a normal day's work for a tannery employe:

	Light calf.	Med. calf.	Hvy. calf.	Med. kip.
Shaving by hand	90	84	76	80
Scouring on grain	500	450	400	350
Setting out on machine	300	260	250	210
Setting out from machine	100	88	80	...
Setting by hand	80	70	65	60
Whitening	66	60	54	48
Priming by boy	350	325	275	250
Boarding	125	115	100	95
Glassing from machine	190	180	170	160
Man to paste and boy to hang up, per hour	75	70	60	55
Glass out paste, per hour	75	70	60	55
Man to gum and boy to hang up, per hour	100	90	30	20

COST OF TANNERY LABOR AND MATERIALS FOR SKIRTING SADDLERY AND FAIR LEATHERS.

The following I have found in practical experience to be the cost of labor and materials in the tanning and currying of collar, strap, skirting, bridle, seating, line and all fair leathers:

Beam house labor	6 c	per side
Yard labor	3 c	per side
Pressing and milling labor	½c	per side
Skiving labor	1¾c	per side
Splitting labor	1 2-3c	per side
Shaving labor	¾c	per side
Milling labor	¼c	per side
Pressing labor	¼c	per side
Currying labor	½c	per side
Milling labor	1 1-3c	per side
Setting out labor	4 c	per side
General labor, engineers, foremen, clerks, watchmen, etc	16 c	per side
Total labor cost	36 c	per side

The cost of the materials used, exclusive of bark, is as follows:

Lime	1c per side
Bark	13c per side
Grease	11c per side
Total	25c per side

It will thus be seen that the total cost of labor and materials is 61 cents per side of 24 feet.

Tannery Materials, Chemistry, Etc.

SAMPLING OF DRY AND PASTY EXTRACTS.

By Dr. B. D. Westenfelder, Cincinnati, Ohio.

The proper sampling of a lot of dry or pasty extracts is the first desideratum. No matter how carefully the analytical work may have been done, the results amount to naught—and in fact lead to discrepancies which can never be reconciled—unless the sampling has been thoroughly and properly done.

The object of sampling is to get a smaller lot which truly represents the whole, viz., the shipment. It is a fact which cannot be denied that if the whole lot—say 500 bags, more or less—of quebracho extract is dissolved in water and thoroughly mixed, that a sample from any part thereof will accurately represent the whole. This being impracticable, we resort to means which approach as near to the ideal one as possible. Hence it follows that the greater the number of samples taken, the nearer the sample represents the whole. An official method can, therefore, only prescribe the minimum and not also the maximum number of samples to be taken, so that if one chemist chooses, for sake of accuracy, to sample 20 per cent, or even 100 per cent, of a lot of extract, and another samples, say, 5 per cent, it goes without saying that the samples representing the larger number of samples should be taken as the correct ones. The sampling must, of course, be done by the chemist himself, or at least under his supervision, by an intelligent person, who clearly understands the object of the work. Then and only then can the chemist stand back of the results of his analysis on the particular lot of extract.

CURIOUS EXPERIENCE.

There is one experience I have in mind which happened some years ago. A lot of quebracho extract—some 500 bags—was shipped from the continent of Europe to an inland city in this country. An English chemist's report came with the invoice. His report showed a very low percentage of moisture (15 to 16 per cent), and a correspondingly low percentage of tannin. When the shipment arrived at its

destination I personally had taken 180 samples, in three lots of sixty bags each, and found moisture contents to be between 24 and 25 per cent, and a correspondingly lower percentage of tannin. Part of my samples was sent to the same English chemist, who now found between 22 and 23 per cent moisture, and a corresponding percentage of tannin. The great difference between his first and second results had to be explained in some way by the manufacturer. It seems that the chemist took it upon himself to do this by saying that his first analysis accurately represented the shipment as it left the continent of Europe, and that the cargo had gotten wet, etc. The fact of the matter is that the lot was some 5,000 pounds short in weight, although the number of bags tallied with the invoice.

The point I wish to make is this, that no chemist can vouch for any sample to represent a cargo, unless he has taken a sample as stated above. All that the English chemist could have possibly said was: "Those figures are the result on sample submitted to me."

CAREFUL SAMPLING NECESSARY.

The writer has had considerable experience along this line and has always made it a point to sample, or under his immediate supervision, 60 bags out of every 300 bags.

One of the most absurd objections made against this method of reasoning by the seller, who, although admitting the absolute correctness of it, was that it is impossible for them to sample a cargo of 5,000 or more bags to the extent indicated, viz., 20 per cent or thereabouts. "This being the case, it made no difference how much more accurately the sampling had been done at the tannery, they would not allow it in practice, as they must treat all tanners alike." In other words, they must have uniform results, as they bought on units of tannin on samples taken by them. It stands to reason, everything else being equal, that the tanner does not care what the car of extract weighed or analyzed on seaboard. All he cares about is what it weighs and analyzes at his tannery. The importer samples, say, 2 per cent, or 100 bags, on a cargo of 5,000 bags. Say that this is divided into ten cars of 500 bags each and shipped.

SAMPLE CARS AS THEY ARRIVE.

There is not a chemist who takes any pride in his work, or who is conscientious, who would sample only one car in case the whole ten cars were sent to his place, and be satisfied to let this one sampling represent the whole. Such a chemist would sample every car as it arrives. If he took only 5 per cent on each car, viz., 25 bags, his total samples would amount to 250 bags. Will this not be actually nearer the truth than 100-bag samples? How much nearer the actual truth where 100 bags per car, or a total of 1,000 bags per cargo, will be is

now evident. I will admit that it would be a task for the seller to sample on a scale indicated, but that should not give them grounds to object to the tanner to do so. Their contention that results are uniform does not hold good. I know of many cases where discrepancies have occurred in so simple a determination as moisture contents, and which can only be accounted for that samples were different. The differences were not within the experimental error, or due to the personal equation, but considerably outside of these limits. If a cargo, say, 5,000 bags, were all of one strike, the chances are that a single bag might represent the whole; but as there is no pan of such a capacity, the cargo represents at least more than one, or as many strikes as the number of times the pan is contained in 5,000 bags, or even more when extract has been allowed to accumulate before shipment.

VARIATION OF ANALYSES.

It is not uncommon for quebracho extract of the same manufacturer to vary from one to two points, or even more, on the same percentage of moisture basis. If that were not the case, a simple moisture determiation would accurately fix the tannin value. The cause of this variation is not within the scope of this article. Take, for instance, a 500-bag lot of quebracho made up of 300 bags of 65 per cent strength, and 200 bags of 63 per cent strength. It is evident, each bag weighing practically the same, that the average tannin strength will be 64 2/10 per cent. If we, therefore, took exactly three parts of the 65 per cent strength and two parts of the 63 per cent strength in sampling and mixed them thoroughly, our analysis would show exactly 64 2/10 per cent strength. If we should reverse the proportion in sampling, our result would be 63 8/10 per sent. But if we happen to strike either one kind alone in sampling, our result would be either 63 per cent or 65 per cent, as the case may be. Having no way of identifying the different strengths of extracts in a lot, we can only eliminate the chances of getting all of one or the other by increasing our number of samplings. It is therefore evident that in sampling 100 bags the chances for getting the proportionate amounts are ten times greater than when only ten bags are sampled. We have now arrived at the most important step, from the chemists' standpoint, and that is how to dispose of our sample. After having obtained the required sample, it is absolutely necessary so to mix the sample that any fractional part thereof whatsoever must be the same as the whole.

ONLY TWO WAYS.

I have considered this from every possible standpoint, both theoretical and practical, and find there are only two ways. The first by grinding the total sample to an impalpable powder and thoroughly

mixing. This is an impossibility, and if it were possible the chances for error are so great that the results are always open to grave doubts. One of these is that the extract has to be dried at a temperature considerably above the air temperature, thereby increasing the insolubles. I have satisfied myself of this by actual trial. When one considers the methods used by practically all the chemists for taking the required amount for analysis, it is not astonishing when discrepancies occur. It is more astonishing that results agree at all, as will be evident later on. This, of course, is due to a mere chance. Fresenius, in a note to the student in Quantative Analysis, says: "The fact that the results foot up exactly 100 per cent in an analysis does not prove that the student's work has been absolutely perfect; on the contrary, it is more likely due to a compensation of errors." I may not have quoted this exactly, but the idea is expressed. The method in use by nearly all chemists is to empty sample, say one-half pound, into mortar and crush; mix half, quarter, etc., and grind part of this for his final sample. It is only by chance, and the merest chance at that, if he obtains a smaller quantity which accurately represents the whole sample. The chemist will readily understand this, but as the article is also written for the layman, I trust it will not appear pedantic.

It will be apparent that if we take a mixture of gold and silver—say particles about the size of peas—that it will be impossible to take samples from the mixture having in every and any case the same proportion of gold and silver, no matter how thoroughly the two might have been mixed. I have put this point up to chemists who have had much experience in the analyses of alloys, and they have all agreed that in order to overcome the effect of "segregation" it is necessary to dissolve the whole sample in order to get the relative proportion of the metals in the alloy.

The second method of making the whole sample homogeneous is by solution and has absolutely no objectionable features. It has been thoroughly tried out by me during the past ten years, by having been used on many car lots of quebracho. The sample is collected in a sufficiently large tarred bucket and carefully weighed to within one-half ounce. About the same weight of distilled water is then put on the extract in the bucket and set in a steam water bath and stirred and heated until thoroughly dissolved. As only about one-third of the height of the bucket sets in water, the temperature of liquid extract never goes beyond 175 degrees Fahrenheit.

DISSOLVING THE EXTRACT.

In order to know beyond any doubt when the extract is dissolved, I let the bucket stand in the water bath for ten or fifteen minutes, without any stirring. At the end of this time I feel around the sides and bottom with stirrer for particles which might have settled out

and are not dissolved. In most cases no such particles are found. If they are the whole is again thoroughly stirred and allowed to stand as before, when the solution will be found to be perfect. To complete the solution as described takes from one to three hours, depending on initial temperature of extract and water.

The bucket of extract is now set in cold water, stirring all the time, and cooled to about 140 degrees Fahrenheit. The bucket is then placed on scales and the weight made up to double the amount of weight of dry extract. It is of course understood that in heating to dissolve the extract, a certain quantity of water is evaporated, but the final weight is made up, after cooling, with water. The liquid extract is now thoroughly stirred and an aliquot part—say one quart—is immediately taken out for the final sample. I have introduced a precautionary measure by straining the liquid through horsehair into a bottle, so as to remove particles of paper, fiber, etc.

It is now evident that the quart sample is not only an aliquot part of the whole, but also an aliquot part of the dry extract. I give an actual example of weights, etc.:

	Lbs.	Oz.
Weight of bucket and dry extract	15	8½
Weight of bucket	2	8
Weight of dry extract	13	½
Weight of bucket and dry extract and water	28	9
Weight of bucket	2	8
	26	1

Therefore 26 pounds 1 ounce of liquid extract equals 13 pounds ½ ounce of original extract. I might say that I also dissolve all smaller samples in the same way for analysis.

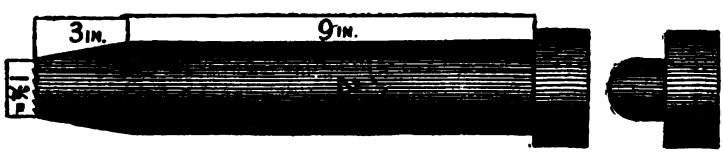
SOME EXPLANATIONS.

The object of making one part of dry extract up to two parts of liquid extract is not only for convenience' sake in weighing, etc., but I also find that the thicker the liquid the less chance for separation. In other words, the liquid remains homogeneous much longer than a lighter one. Nevertheless, I have always made it a point never to take a sample from the quart sample unless the quart sample was first heated to about 140 degrees Fahrenheit and most thoroughly shaken. The object of heating is to make the liquid more limpid, so that it can be more thoroughly mixed by shaking. The quantity of extract necessary for analysis—always remembering that two parts of liquid extract equals one part of the original dry extract—is now roughly weighed in a weighing stoppered bottle. The contents are cooled to air temperature and then accurately weighed. Should it happen that the weight

is greater than intended, a fresh quantity must be weighed off. The weight cannot be adjusted by simply pouring some of the extract out of the flask, as moisture has condensed on its sides, and an aliquot part therefore cannot be poured off. A little practice will therefore do away with a second trial. My practice has been: Put weighing bottle and stopper on ordinary balance, weighing to within one-half grain, and after heating and thoroughly shaking the bottle of extract, pour same into beaker and pour from this into bottle. This operation can and must be quickly done. Stopper bottle immediately.

SAMPLING DRY EXTRACT.

In sampling dry extract, I use a tube which I consider an improvement over the generally used method, viz., cutting a section. The tube is made from a 2-inch steam pipe about 12 inches long, by tapering one end and which is the cutting end. The other end has an iron ring, made from one-half-inch stuff, shrunk on it. A head of steel with a lug to fit loosely in this end of tube is made. The following is a rough sketch of it:



It will be noticed that the shoulder of taper to end is about 3 inches long. The opening at end of taper is about 1¾ inches. This end is made sharp, or still better, by filing teeth such as a saw into it; it takes hold better. The method of procedure is as follows: The tool is placed upright on a bag of extract, the head being on the tube, and driven clear through by means of a 12 to 14 sledge hammer. The tube is now pulled out, head taken out and tube suspended over a receptable when contents will fall out. The cutting end being smaller, no extract will fall out at this end. On the other hand, the opening toward the other end being larger, no wedging of extract will take place. As I stated at the beginning, the cut is made through whole bag, paper and all. The particles of bag and paper are carefully picked out before weighing sample. A man with an active assistant can sample 60 bags in about 90 minutes, or even in less time. A sample from 60 bags will average about from 10 to 15 pounds, depending on thickness of bag. The object of using the head will now be apparent, viz., to prevent the end of tube from being knocked out of shape by the sledge hammer; lug on end of head to keep it in place while driving with sledge.

SAMPLING PASTY EXTRACTS.

To sample pasty extracts, such as gambier, I use a tallow tryer, which cuts ont little cylinders of extract and which can be scraped off with a stick into a bucket. It is advisable to sample every bag of this material which can be conveniently done as the car is being unloaded. It takes but a moment to stick a bag. As gambier contains between 30 and 40 per cent of water, it is necessary to add only about 10 per cent of water, heating in bath, same as quebracho, from 5 to 6 hours, while stirring frequently. Then allow to stand quietly in air until set. This may take ten to twelve hours. The whole is now weighed. The top layer of fiber is now removed and a goodly portion of the clean pasty extract taken out and further mixed, when the sample is ready for analysis. This method of procedure is not entirely free from objections, but I am staisfied, after years of trial, that it is the best that can be done.

FORMIC ACID.

Formic acid is increasing steadily in popularity in tanneries on account of its economy and success in deliming and plumping. It is being sold 75 per cent strong and has many advantages over other acids used for beamhouse work. In other words, one pound of formic acid will do the work of five pounds of other acids. When used there are no complaints afterwards of harsh effect upon the grain of leather. It is considered advisable, however, for tanners employing formic acid for deliming to add a small quantity of glucose in combination with the acid, as much better results will be obtained than by the use of formic acid alone.

FORMIC ACID QUICK AND PENETRATING IN ACTION.

In plumping hides or skins the acidity of a liquor does not exceed one-half of one per cent, and tanners can easily calculate the quantity of formic acid that should be added to a vat of liquor to obtain that percentage of acidity in his liquor. The weaker liquors in a tannery, such as handlers, hangers or rockers, do not require over one-quarter of one per cent acidity to obtain good, plump leather. The action of formic acid on the hide is quick and penetrating. It also acts as a preservative on the hide and retards any putrefaction which might take place in the weak liquors, and unlike other acids, formic acid is volatile and can be removed from the liquors by passing them through a heater on their return to the leach house. This is very important, as a large quantity of liquor in some tanneries is returned to the leach house to be purified, strengthened and sweetened.

FORMIC ACID IN THE BEAMHOUSE.

In sole leather tanneries, where dry hides are tanned, the hides are sweated, and after leaving the sweat-pits they are worked through the beamhouse. The hair is removed in the sweating process by starting a slow putrefaction in the hides, and we would recommend the use of formic acid in the beamhouse to arrest this putrefaction in the hide as quickly as it is taken from the sweat-pit. This undoubtedly is a very important point in the use of formic acid, and, so far as we know, no other acid will serve this purpose. It requires a very small percentage of formic acid in water to arrest this decomposition of hide substance, and we believe that 5 per cent is a sufficiently strong solution.

CHEMICAL ANALYSIS OF FATS AND FATTY MIXTURES.

The leather trades chemist is often called upon to decide the value of fats and fatty mixtures, or to determine the nature of the fats in finished leather. In work of this kind it is always of the greatest importance that the chemist be supplied with a sample which represents a general average of the material to be tested. Most of the discrepancies in results are due entirely to unlike samples. A sample, therefore, should be taken from as many parts as possible of the material to be tested.

The nature of many of the harder fats used in the tannery is often sufficiently judged by the ordinary senses, as appearance, feel, taste, smell, etc. But in the purchase of vast quantities the trifling extra cost of additional technical tests is considered profitable by progressive tanners. For instance, when the price of oleo stearine is nearly double that of tallow, as recently, it is especially gratifying to the buyer to know that he is getting the No. 1 article when he is paying the corresponding price.

TESTING.

The chemist, on being called upon to test the quality of a fat, melts up and thoroughly mixes the whole sample submitted, which is used for all subsequent tests.

The melting point is the first thing usually found. This is made by immersing the bulb of a large bulbed Fahrenheit thermometer in the melted fat and then withdrawing. A thin film of grease adheres to the thermometer, which is laid in a cool place for a definite time—usually one hour. It is very important to get just the right thickness of fat on the bulb in order to obtain accurate and constant results.

The thermometer is then supported in the neck of a closed flask so that the bulb occupies about the center of the inside of the flask. The flask is now slowly heated on a water bath until the film of fat

on the bulb melts, becomes transparent and finally runs down, forming a large drop at the bottom of the thermometer bulb and eventually falls off. The point indicated on the thermometer at which this drop falls off is taken as the melting point of the fat.

A CORROBORATIVE TEST

and one more reliable is the titer or solidification point of the fatty acids, and is made up as follows: Boil a portion of the sample with excess of caustic potash until saponification takes place. Remove the lower or alkaline solution by separatory funnel and add excess of mineral acid, liberating the free fatty acids which rise to the surface. The fatty acids are washed several times, or until free from mineral acid, are then filtered and dried. A portion of this filtered and dried product is placed into a small test tube, which tube is itself inserted into a larger tube, forming an air jacket about the fat and preventing too rapid cooling. The apparatus is now exposed to lower temperature, the fatty acids being slowly and constantly stirred with the bulb end of a centigrade thermometer. As soon as the acids commence to congeal the mercury rises very slightly in the thermometer and remains stationary several seconds, or until the whole mass congeals, after which it again falls. This stationary point is the titer of the fat and in conjunction with the melting point is used to determine hardness of fats.

THE SAPONIFICATION VALUE OF A FAT

is depended upon to show the presence of non-fatty substances, mineral oils and waxes. This test is made by dissolving a known weight of the sample in an alcoholic solution of caustic potash of known strength and boiling until saponified. The excess of alkali is determined by titration with standard acid and the weight of alkali taken up by the fat is thus found. This weight of caustic potash divided by the weight of the fat used, multiplied by the factor 10, gives the saponification value.

In cases of low saponification values the unsaponifiable is often determined as a check on the above test. This is done by saponifying a weighed portion of the fat with caustic alkali and shaking the whole mixture with purified petroleum spirit, thereby dissolving the unsaponifiable and withdrawing same by use of the separatory funnel. The petroleum is evaporated off and the residue finally weighed in a previously weighed flask. The saponification value and the percentage of unsaponifiable are of chief value in determining the purity of the oils and for finding the presence of the mineral substances in the fats.

THE ACID VALUE OF A FAT

is made and is chiefly used in determining rancidity and the fermented state of fats and oils or to test for the presence of added acids. The

acid value is made by dissolving a weighed portion of the fat in warm, very slightly alkaline alcohol, the excess of acid being titrated directly with standard alkali and calculated in terms of percentage of caustic potash.

The above are a few of the more common and useful chemical tests made in determining the purity or adulteration of fats and greases used by tanners.

All of the results obtained from the above outlined tests are compared with tables of standards on file in the laboratory and are very often further corroborated by the preparation of similar mixtures from known fats and oils based on the revelations of the chemical analysis.

There are many other tests used by chemists in the analysis of fats and fatty mixtures, but unfortunately there are no such clearly defined, reliable methods for taking apart organic compounds of this kind, as is the case with inorganic substances. The greases, such as the stearines, tallows and degras, each consist of several organic compounds in themselves. When, therefore, they become still further compounded, as by the admixture of all together in different proportions, it can be readily seen that the problem of the chemist—that of submitting definite results—is one of extreme delicacy and of the most careful observation and manipulation.

CHEMISTRY IN LEATHER MANUFACTURE.

It is becoming more and more evident that manufacturers of leather of all kinds can be greatly aided and protected by competent leather trade chemists.

The manufacture of leather is essentially a chemical process, calling for the judicious application of various materials. It is the function of the chemist to protect leather manufacturers from impure materials being foisted on them and to aid them in keeping the cost of production at the lowest point consistent with good results.

The leading tanners maintain their own well equipped laboratories and well paid chemists at considerable expense, but the fact that they are willing to do this year after year is eloquent testimony of their belief in the profit and necessity of this expenditure.

Some tanners, from lack of acquaintance with what competent chemists could do for them, are inclined to be indifferent in the matter. Other tanners, who have learned to appreciate the wonderful help which may be obtained from scientific men, have found that it pays them handsomely to have each step of their process tested regularly so that they made be safe from wandering into dangerous paths. A harness tanner not long ago was offered a lot of bright looking tallow at a little below the market price. Before purchasing he sent a sample to his chemist, who at once replied that the tallow would be dear at

any price, as it was adulterated and unsafe to use in leather making. This information probably saved the tanner a large sum of money and prevented him from shipping out leather which would be followed by a storm of protests and complaints from disappointed customers.

The United States Leather Company, and other big tanners, have the spent tan of each bark leach tested, thus stimulating tannery foremen to give the closest attention to their work, as carelessness would be exposed by the chemist. Sweet and sour liquors are also regularly analyzed, so that the tanners are kept fully informed and are saved the distress of suddenly finding their liquors in bad condition. A stitch in time saves nine. Judicious expenditure for chemists' services is more than likely to save ten times the amount invested by the tanner.

ANALYZING SPENT TAN.

It costs a good deal to pile bark, grind and leach it, and if it is not being properly and fully leached, the tanner should certainly know it, says a tannery foreman.

I have two tanneries under my charge and I find that it is absolutely necessary to have our spent tan constantly analyzed. Some tanners have their spent tan analyzed once every few months, and even then grudge the money for this work. That is all foolishness. Instead of tanners complaining about lack of profit, they should look to their own fences and be sure they are not throwing money away, as many of them do.

TEST SPENT TAN DAILY.

A tanner with two or three batteries of leaches under his care should see that the spent tan from each leach was tested every day. Don't laugh at me, brother tanners. Those who ignore my suggestions are far more fit to be laughed at. When spent tan is regularly analyzed, it will be found that the leaching will be all right for a few days, and then suddenly be faulty. I know what I am talking about.

For instance, spent tan, in my opinion, should not contain more than 1 per cent of tannin. It hardly pays to exhaust much closer than 1 per cent. I have seen analyses, however, of spent tan which showed 1½ to 2 per cent and over. The 2 per cent tan simply showed that 10 per cent of tannin was thrown away.

VALUE OF WATCHING CLOSELY.

There is one benefit of watching spent tan closely; it informs the tanner if the liquor runner or leach house man is attending properly to business. Whenever I have found spent tan containing much more than one per cent, I have promptly called the leach house man to

account, and he could not possibly squirm out of the fact that his work was careless. Sometimes there is a breakdown in the mill or conveyor, and the boys try to make up for lost time by hurrying the leaching and not exhausting the bark. A tanner may be fooled by his help, but you cannot fool the chemist. The leach house man whose work is being carefully followed and tested is going to do far better and more careful work than the man who knows there is no check on what he does.

CHEMIST A NECESSITY.

Tanners may claim that they cannot afford to employ chemists. For my part, I am decidedly of the opinion that they cannot afford not to employ a chemist. If a tanner has only a small place, he should arrange with other tanners in his neighborhood to coöperate; between them the expense would be very moderate. It certainly would be a good deal cheaper to pay a fair price for steady services from a chemist rather than keep losing 10 per cent on the value of your bark. Figure up your bark cost for one year and then see what 10 per cent of it amounts to. Bark tanners may laugh and think that this talk is all foolishness. All right; at the same time let them have the spent bark from each leach analyzed daily for from two to four weeks. They may find enough irregularities in leaching to make them turn blue and red.

Besides analyzing spent tan, a good chemist can do valuable work in the beamhouse and in seeing that the currying and finishing materials are exactly as represented to the tanner and not adulterated and dishonest.

The leading and most successful tanners have their own chemists, who are kept busy all day long, and who are often big money-makers for their employers. The big tannery corporations employ at least two or more chemists, and in consequence are able to conduct their business with far less guesswork and uncertainty than tanners who believe they are above and beyond the help and protection of chemists.

WILFUL WASTE.

In these days of small profits it is pathetic to see small tanners who need all the money they can possibly make, wilfully throwing a good income away every year in the shape of unspent tan. It would pay an enterprising chemist to contract with careless bark tanners to analyze their spent tan right along on condition that they receive 25 per cent of what their services save the tanner.

I do not suppose that my advice will have any influence on the minds of the many lazy tanners who seem blind to what science can do to help them, but possibly here and there some earnest and ambitious man with a small tannery may try and get other tanners to join with him in hiring a chemist, experimentally, so to speak, for six or twelve

months. Such tanners, instead of encouraging their chemist to work on fancy schemes of quick tannage, should begin by keeping him busy on watching their spent tan and analyzing the currying and finishing materials they use. It would not be bad policy for such bright and wideawake tanners to diplomatically notify those who sold goods to them that they had their own chemist and that unless goods proved to be exactly as represented they would not be accepted.

I know that it is going to cost tanners some money to have their spent tan from each leach carefully analyzed, but it will be found that this cautiousness will be handsomely repaid; and once followed, will never be dropped.

GALL-NUTS.

Gall-nuts are hard, woody swellings of an olive-gray or bluish tint, of a more or less wrinkled exterior, and yellowish-brown interior, formed by punctures of insects on the twigs of a species of oak common throughout Syria and Asia Minor. They are exported from Smyrna, Aleppo and other parts of the Levant, as well as from the East Indies, to all portions of the civilized world, and used for tanning and dyeing purposes, but more especially in the manufacture of writing inks. They have no odor, but taste somewhat bitter and are powerfully astringent. These nuts give some 60 to 70 per cent tannic acid and 2 to 3 per cent gallic acid. They produce black dyes when mixed with solutions of sulphate of iron, and are common in most morocco factories today. In the manufacture of ink they are bruised and exhausted by three successive boilings, each time with a reduced quantity of water, and while the solution is warm a certain proportion of sulphate of iron and gum arabic, also in warm solution, is added, and the whole allowed to remain for some time, or until all sediment is deposited. Gall-nuts are principally exported to the United States from Smyrna and Trieste, and they are so common near Aleppo that they sometimes are called "Aleppo galls." Those gathered before the fly issues are known as blue galls, and are most valuable. The second gathering, or white galls, from which the fly has escaped, are of an inferior quality.

Notwithstanding recent discoveries in coal-tar dyes and in the art of dyeing, these galls are still an important article in the arts.

TANNIN VALUES OF HEMLOCK BARKS.

That there is considerable difference in the tannin value of hemlock barks obtained from various districts is a well established fact, but, on investigating the question from a chemical standpoint, the difficulty of obtaining samples which may be justly compared must be recognized,

local conditions, for example, growth, harvesting, sort of district and conditions under which bark is grown.

Bark from the same locality may vary considerably. In bark gathered from low lands or hills and from an individual tree differences in thickness are apparent. These factors all play their part in influencing the tannin value.

The following illustrative analyses of Canadian samples are the mean result of a number of leech and picked samples, the selected samples being taken of similar appearance and of characteristic growth representing the district. The geological formation of the Muskoka district is granitic; the Guelph, limestone, and the Kingston, limestone of a crystalline character.

The following analyses are on a dry basis and were determined by the hide powder method of analyses (T. A. L. T. C.):

	Tannin.	Non-Tannin.	Insoluble Matter.
Muskoka district	11.26	7.45	81.29
Guelph district	10.40	6.91	82.61
Kingston district	9.84	6.86	81.29

To compare with these the following picked samples from American points:

	Tannin.	Non-Tannin.	Insoluble Matter.
Winchester, Pa.	10.99	7.05	81.96
Ontonagan, Mich.	11.23	6.68	82.09
Washington	11.15	7.71	81.14

Analysis of a heavy Muskoka bark 1⅛ inch, good sample, showing tannin contents in its distinct parts:

	Tannin.	Non-Tannin.	Insoluble Matter.
Entire	11.40	7.08	81.52
Ross	5.28	3.53	91.19
Cortex	12.83	6.03	81.14
Flesh	10.45	10.33	79.22

Analysis similar to above of a light young Muskoka bark, ½ inch:

	Tannin.	Non-Tannin.	Insoluble Matter.
Entire	10.08	5.83	84.09
Cortex	14.13	5.00	80.87
Flesh	7.19	10.18	82.63

While a certain stick, a portion of which had been much weathered and was mildewy, the balance being comparatively sound, analyses as below:

	Tannin.	Non-Tannin.	Insoluble Matter.
Sound	10.28	5.83	83.89
Mildew	8.75	5.88	87.37

In appraising bark, the appearance may be taken as a criterion of preparation, weight must be considered with regard to water contents; *i. e.,* seasoning, the thickness of a sample of standard quality gives no clue to its tannin value, barks of various districts of tanning maturity and maximum tannin contents with varying growths. The determination of tannin contents should always be the subject for a chemical determination, and as a variation of 13.5 per cent from that estimated is well within bounds of practical experience a very profitable investigation may result,

SOME DYE STUFF SUGGESTIONS.

As colors are likely to become popular again, leather dyers may be interested in a few general directions for blending, says an experienced dyer. I would suggest that you work with straight colors in blending. Never use any mixtures, as one can never be certain of the results with mixtures. With six to eight straight colors, a dyer can get any color required and is quite as likely to catch on to some new attractive shade as any of his rivals by experimenting with the different proportions of dye stuffs. Straight colors are best, as they dye easily and require no mordant.

Red and its modifications—fuchsine, red and purple shades.
Yellow—Chrysodine.
Green—Straight iodine green.
Violet—Methyl violet.
Bismarck brown—Yellow and red shades.
Maroon—Three parts fuchsine and one part R. Bismarck.
Claret—Three parts fuchsine and one part violet.
Cardinal—Three parts fuchsine and one part chrysodine.
Garnet—Three parts fuchsine and two parts chrysodine.

VIOLET COMPOUNDS.

Plum Color—Six parts violet, one part R. Bismarck, one part green. Bismarck darkens. Less Bismarck and more green gives bluer shade.

Wine Color—Six parts fuchsine, one part violet, one part chrysodine. Fuchsine and violet alone make fine bluish color. For old rose, use wine color very sparingly and vary proportions to shade.

YELLOW COMPOUNDS.

Old Gold—Thirty-two parts chrysodine, one part green. Old gold darker, add two ounces yellow Bismarck to above.

Yellow Bronze—Eight parts chrysodine, two parts yellow Bismarck, two parts green. Olive bronze same as above, but three parts green.

BROWN COMPOUNDS.

Terra Cotta—One part fuchsine, two parts chrysodine.
Mahogany—One part fuchsine, one part red Bismarck.

GREEN COMPOUNDS.

Medium Green—Eight parts green, one part violet, one part yellow Bismarck.

Dark Green—Four parts green, one part violet, one part red Bismarck.

BLUE COMPOUNDS.

Navy Blue—Three parts soluble blue, one part violet.

Peacock Blue—Three parts water soluble blue, one part green.

Any blue can be darkened by indualine negrosine, etc., and worked in same bath.

Any shade of brown can be made with seal brown if you get a good straight color. Olive brown is got by using green first and then seal brown in same bath; depth of shade depends upon quantity of green used. One part to eight parts of seal brown and increase green to get shade required. By using negrosine in same way as green any depth of brown can be obtained with seal brown.

ANALYSIS OF BARKS.

By Dr. Louis E. Levi and Earle V. Manuel, S. B.

In former articles, written by one of us, on the analysis of different barks, leaves and woods, we had the pleasure of giving to the readers of this journal the composition of the different materials which came to our special notice, viz., Cuban, Argentinian, Nicarauguan, Wisconsin materials, the horse chestnut and the oak. As these researches are becoming more interesting every day on account of the depletion of our forests and also from the standpoint of scientific knowledge, we again take up this subject. We know very well that many of the materials which come to our notice contain not enough tannin to be of interest to the manufacturer of leather or extracts, yet for the purpose of enriching the general literature, which is still lacking in a great many points, we offer the results of our investigations without further apology.

The following are the results of analyses of the barks:

Kind.	Sol. solids. Pct.	Non-tannin. Pct.	Tannin. Pct.
Ludington, Mich.—			
Soft maple	5.40	2.58	2.82
Hard maple	2.05	1.70	0.35
Oshkosh, Wis.—			
Black ash	4.92	4.81	0.11
Nappanee, Ind.—			
White oak	3.64	1.36	2.28
New Orleans, La.—			
Cypress	1.60	1.10	0.50
E. Jordan, Mich.—			
White pine	3.07	2.08	0.99
Atlanta, Ga.—			
Yellow pine	2.73	1.86	0.87
Bayfield, Wis.—			
Northern spruce	10.69	4.11	6.58
Ludington, Mich.—			
Basswood	2.22	1.60	0.62
Birch	1.61	0.49	1.12
Beech	3.22	2.18	1.04
Arizona, La.—			
Red oak	14.49	5.08	9.41
Red oak	16.07	4.95	11.12
Red oak	10.25	4.86	5.39
Red oak (green)	12.18	4.94	7.24
Red oak (green)	8.54	2.85	5.69
Sweet gum	12.00	4.43	7.57
White oak	8.42	3.31	5.11
White oak (green)	7.87	2.71	5.16
White oak (green)	11.60	4.48	7.18
White hickory	17.70	8.22	9.48
White hickory	16.96	7.13	9.83
White hickory	9.38	4.43	4.95
White hickory (green)	12.97	6.49	6.48
White ash	32.14	27.65	4.49
White ash (green)	10.05	5.32	4.78
Yellow pine (short leaf)	7.53	4.15	3.38
Yellow pine (short leaf)	8.02	2.35	5.67
Chestnut oak	7.57	3.02	4.55
Cypress	4.32	2.61	1.71
Burr oak (green)	9.00	3.38	5.62

Hides and Skins.

CURING OF HIDES AND SKINS.

By Alfred Seymour Jones.

Some time ago there was a discussion in the columns of *Hide and Leather* regarding salt stains and other damages to skins. The eminent English tanning authority, Alfred Seymour Jones, was appealed to. He responded with this valuable article:

If we are correct in putting the cause down to iron, I can only think that one of two things is happening. First, ordinary rock salt, which is very liable to contain iron in the form of chloride or oxide, is employed, or the iron contained in the blood reacting on the salt may cause the stain, but such usually possess a peculiar marbled marking.

SALT STAINS.

Secondly, and I incline to this supposition, old salt which has been used for salting skins produces a salt stain apparently not due to iron, but to the coloring matter produced by some fungoid or bacterial growth which it is impossible to remove. It does not follow that iron is not present—most probably it is, in the salt or blood. In hide and skin salting houses it is no uncommon thing to see blood-stained salt re-used to cure a second, third or more lots, and as we know that common salt is incapable of killing most bacteria, however concentrated, we shall be right, in the absence of further knowledge, in assuming that the cause of Messrs. Schmidt's trouble is probably due to old salt, which has become infested with either fungoid or bacterial growths, reacting upon the iron present in the blood or salt.

CLEANLINESS VERY NECESSARY.

I do not propose for one moment to write about the excellent "takeoff" and "cure" as performed by the large abattoirs in North America, Europe, Australia, New Zealand and South America. Our troubles in "takeoff" and "cure" would be small, comparatively, were all animals slaughtered in such places, but, unfortunately, a large proportion of skins are country slaughtered, with country flaying and

country cure. It is these skins which leaven the lump and are sometimes mixed in with city slaughtered, carrying the germ life which may upset all our calculations.

Hides and calfskins, from whatever source collected, should be carefully cleansed of adhering dirt, blood and loose flesh before salting, which should always be done with fresh crystallized salt, upon the lines followed out at the Chicago stock yards.

WATCH YOUR SALT.

In buying crystallized salt, care should be taken to see that it is as free as possible from iron in any form. When salt is shipped, unless it is in bags or sacks, it is liable to contain foreign salt. Take as an example the Cheshire (England) salt, which is shipped so largely all over the world. Generally it is carried from the salt mines in loose bulk, on railways (iron) in open trucks, wholly or partly made of iron, is deposited on quay, where wear and tear of iron abounds, to be loaded with iron shovels into the holds of iron ships, again discharged onto quay at port of destination, and handled, carried, etc., in a similar manner to the hide man from port of discharge.

Is it any wonder that iron particles appear among the salt crystals? The remedy points in the direction of either shipping the salt in bags or pressed cakes. In countries like Austria and India, where salt is heavily taxed, if not a close government monopoly, which it is in Austria (may I mention in passing that in the great salt mines of Wielitscka, in Gallicia, which have been worked for over 1,000 years, all the employes when "leaving off" are searched, even to the boots, for salt), need we be surprised that the skins coming from such countries are liable to give us trouble in our factories? The heavy tax is fixed on salt as an article of necessity in the food of man. In order to overcome this tax the salt is "denaturized"—that is, rendered incapable of being used as a food—by adding such materials as alum, carbolic acid, petroleum, naphthalene, etc. Alum is frequently used in Europe on hides from northern Italy and the countries immediately to the north of it. The use of salt for curing purposes is "as old as the hills." Apparently it has served our forefathers more or less successfully, and there is no reason why it should not continue to have a time-honored place. But we who live in the searchlight beams of the twentieth century should ask ourselves the question, Is there any better method of cure?

CAN SALT BE REPLACED.

We know that common salt has practically no antiseptic qualities; i. e., it is incapable of destroying germ life; but we know that it holds putrefaction in check by withdrawing water from the hide and thus preventing the multiplication of bacteria which are prepared to do

mischief. If we wash the salt out putrefaction is at once resumed by the organisms present. Can anything be added to salt which will make it antiseptic, or is there a something which will fill the bill? The point to be guarded against is, not to use a material which in any way tans or stains the hide. The "cure" used should be capable of forming no reaction with hide substance and so easily washed out by the tanner.

Common salt (sodium chloride NaCl.), clean, applied clean, to clean skins, is difficult to beat. It may not be an antiseptic, but it does perform part of that function by withdrawing from the hides water, without which the putrefaction germs cannot do their work. The salt only temporarily paralyzes them until it is removed by the tanner. The study of "Putrefaction and Fermentation" and its germ life is one of absorbing interest, engaging the attention of the most brilliant-minded men of the day, but there is much, very much, which we all know, or may know, provided we make up our minds to learn from the numerous works already published.

DIRT PRODUCES DISEASE.

They tell us today, what was known to Moses, that dirt produces disease, and cleanliness gives health. Let us apply this statement to the cure of hides and skins. We all know that unless we sow we cannot reap, and that which we sow we shall reap. If we sow putrefactive germs while salting, we shall assuredly reap them in the tannery. Are we not sowing the seeds of trouble in the salting house? Can anyone remember seeing a hide house which was not filthy from floor to ceiling with blood and dirt, reeking with the aroma of putrefaction? Have we not here a cause of trouble which might be remedied by scouring and disinfecting the floors and whitewashing the walls and ceiling with lime regularly, and the hide house to have ample change of dry, cold, fresh air? Moist atmosphere contains usually carbonic acid, which is a friend to the enemies of hide substance, consequently an enemy to the hide dealer and tanner. And, finally, by freeing the hair side from dirt and blood, and the flesh side from blood and adhering flesh, before salting, we shall have reduced the risk of damage to a minimum, at the same time enhancing the value of the hides by a safe, clean cure. I am not unmindful that even with all these precautions germ life is present, but the germs which are enemies to raw hide will have had their energies for evil very considerably retarded, and possibly, in the majority of skins, completely so.

SODIUM SULPHATE SUGGESTED.

I will refer in passing to Prof Eitner's recommendation of sodium sulphate (Na_2SO_4) in calcined anhydrous form. "In this state, when used as a substitute for salt, it has the property, like common salt, of

preserving hide substance by the withdrawal of water, and crystallizes with 10 Aq. (about 56 per cent). This does not run away like common salt brine, but remains in the hide, which retains its weight, and remains plump and swells well in the lime and liquors, which chlorides have a tendency to present; 10 to 15 per cent on the weight of the hide is sufficient, while salt must be used in nearly double this quantity. Care must be taken that the sulphate used is free from bisulphate ($NaHCO_4$), which has a powerful swelling effect upon the hide fiber like sulphuric acid."

Personally I have had no experience with sodium sulphate on Prof. Eitner's lines, but it is generally known as a "cure," especially in India. For example, it is formed while pickling sheepskins with sulphuric acid and salt and doubtless contributes to their preservation. In the preservation of sheepskins after depilation it is common to pickle them in sulphuric acid and salt. I need hardly go into the method of pickling, because it is so well understood. Suffice it to say that any process which employs an inorganic acid is accompanied by danger of a permanent kind. The pickling process as carried out does not act as an antiseptic; molds of several kinds are known to flourish.

FORMIC ACID FOR PICKLING.

My experience goes to show that formic acid has sufficient antiseptic properties to be substituted for vitriol in pickling, provided it is used dilute and plenty of time is given the acid to permeate the hide fibers before the skins are passed into the concentrated salt brine. Such pickling will keep indefinitely under tropical conditions and may subsequently be depickled with greater ease, leaving no deleterious acid behind. The ideal cure is one which effectually cures or preserves the hide in its fresh state, so that on removal of the cure the tanner possesses a hide which bears no effects of the cure employed. Such a cure must have the property of destroying life, and we all know that the composition of bacteria is of a gelatinous nature, consequently any material that affects them must correspondingly affect the skin.

Therein is our difficulty. The essence of the matter is that though many materials may be used successfully as antiseptics, nevertheless their application and subsequent removal are attended with an element of risk which the average man is unable to grapple with. When we consider how the skins are collected and by whom, how they are cured and by whom, one wonders that so many come out on top as they do. Any cure, to be of universal practical utility, must be so simple that any fool can cure successfully.

MUST STICK TO SALT.

To my mind, we must still hold on to salt, but insist upon some such conditions as above mentioned being carried out. I say advisedly

"some such," because the cure by salt will not work in all countries, India for example, consequently environment must govern the curer; but one thing he will always find pays, that cleanliness is next to godliness, even in a hide house.

CARING FOR HIDES AND SKINS AT THE TANNERY.

After the stock has been received, weighed, sorted and put into packs, of different grades, if it is going to be kept for some time, the skins or hides must be resalted. After a few days it is a good plan to make a strong bath of salt and ice-cold water and sprinkle the skins lightly as you turn them, and they will keep through the hottest days and not salt rust, which is one of the greatest troubles a tanner has with stock for grain. Liverpool ground salt is considered the best for resalting, as it has no iron in it. Before resalting shake them well.

DRY STOCK.

When you receive your dry skins, which come in bales, sort, weigh and grade them, and put them in different packs. Pile them up nicely and do not let the men tramp on them, as that cracks the grain and hurts the hides or skins for grain stock. One trouble with dry stock is to estimate the moisture or dampness. The best way to get at this is to take, say, 100 skins, weigh them, hang them in a room not over 65 to 70 degrees, for a couple of days. Then reweigh them, and you will get the percentage. The best way to get the shrinkage of green stock is to take 100 skins from the bundle as they come in, weigh them, shake and hang them over a barrel or horse over night, then reweigh them and get the percentage. All grain stock is bought with an allowed tare, but the greatest trouble a tanner has is to get it within the limit, for, as a general rule, it overruns. French green skins will make nice, fine grain, but the trouble is they are apt to run too plump, and are badly scored in the takeoff. The New York city skins are considered the best taken off, and, as a rule, are in the best condition. The dry skins which come from Vienna and Saxony are very nice, and make handsome leather, if they are properly handled in the beamhouse.

HIDE CELLARS.

Do not make the frequent mistake of having the cellar too close and damp. It should have a good circulation of air through it, and your stock will then keep better and not heat in the hair. If you keep your cellar closed up, it gets musty and close, and the stock then begins to heat and spoil in the packs. After your skins have been weighed, sorted and graded, and put in the packs where they belong, say, 7 to

9 pounds, 9 to 12 pounds, and 15 to 20 pounds, they are ready for the beamhouse. One handy way to keep track of stock in the hide cellar is to have a large bulletin board ruled off in different sections to take care of heavy and light hides, calf and kip of the different grades, showing the receipts each day, and the stock sent up each day. In this way you will always have the balance ready. Of course, this is simply for convenience in the hide cellar, as you have your regular reports in the office.

TRIMMING STOCK.

A good many tanners trim their calf and kip in the cellar, and some trim them in the beamhouse from the soaks.

Personally, I think it is better to trim in the cellar, and a good hide man will do good work, and not take any more off than is necessary. He will trim fully as much as a man in the beamhouse, and the stock is easier taken care of and brings a little more money, as it is in a little better condition. When you trim in the beamhouse, you have to take the stock back to the cellar and resalt, and this not only means extra work, but extra expense as well. Of course, with hides you are compelled to trim in the beamhouse, from the soaks, as you have to cut them into sides, and that can only be done and done right after they are partly soaked, and it is expedient to trimming at the same time.

FLESHING AND CURING PACKER HIDES.

Many tanners keep a record of the fleshings and give the packer whose hides make the best showing the preference when buying. It is natural that tanners should be opposed to paying hide prices for fleshings. It is usually claimed for packer hides that they are uniform in takeoff, condition and curing, but there is frequently much difference between one lot and another in the matter of fleshings. This trouble could be corrected if more gangs were put on the trimming beds. When only a few gangs are trimming and the kill is large, the trimmers have to hurry and slight their work to get the hides out of the way.

INSIST ON CAREFUL TRIMMING.

Cattle are always killed in lots to enable the packers to arrive at the actual cost of each lot. If tanners and brokers would insist upon more careful trimming, the purchase of packer hides would result in greater satisfaction.

Another matter in which packers have an advantage over the tanners is in leaving on the ears and snouts, with great hunks of gristle and fat adhering to the pate. It seems to me that the tanners should

insist upon the packers trimming off the snouts and ears and fleshing the pates. By this reform they would save money on nearly two pounds of glue stock that they are now paying hide prices for. Of course, this does not appear much per hide, but when thousands of hides are purchased the saving would be considerable.

CAUSES OF COMPLAINT.

Another cause of complaint is the dirty condition of some packer hides. This results from mixing old salt with new without washing the old salt, which is greasy and full of dirt and manure. Old salt should be washed thoroughly and all dirt removed before mixing with the new salt. The process of washing old salt would not cause a shrinkage of over 10 per cent and would result in making the hides come up much brighter. In salting hides, about 45 pounds of salt is used, about 50 per cent of which is absorbed by the hides and the other 50 per cent is shaken off and used again.

It seems strange that some packers continue to jeopardize the condition of their hides by using old, dirty salt, when there would only be 10 per cent shrinkage incurred in washing the salt and removing the dirt. Tanners can keep account of these conditions if they will make a note of every lot of hides they receive and institute comparisons. When hides are moving freely there is more old salt to be worked over, but when the market is dull and draggy, as it was for several months this year, there is little old salt on hand and the packers are compelled to use a larger proportion of new, clean salt. If buyers and brokers were to keep track of these conditions, they could select hides from the beds that were made when few hides were being taken up, and in this way get hides that were cured with new salt. Such hides would be clean and bright when taken up.

Of course, some tanners give certain months' takeoff the preference, and these conditions must be regulated according to supply and demand. Still, the point for tanners to consider is the condition caused by using old, dirty salt, and whether influence should not be brought to bear upon the packers to induce them to wash the old salt thoroughly before mixing it with the new salt.

Beamhouse Work.

BEAMHOUSE METHODS.

Strange as it may appear, it is nevertheless a fact that the tanners of today are about thirty years behind the times in their beamhouse work. While they have made gigantic strides in the tanning and finishing of leather, the beamhouse is run just about as it was twenty-five years ago. It is time for them to put in machinery and cut out hand work to a certain extent, but they handle the hides in the soaks and limes in just the same old-fashioned way as our forefathers.

IMPROVED MACHINERY NEEDED.

You can go into a tannery where upper leather is made and in looking over the leather you will come across a side every now and then that is loose, coarse and piped. Ask the tanner what causes it and he will tell you that it was a poor hide. If what he says is true, 25 per cent of the best hides must be poor. You can look over 500 or 1,000 sides or skins that were all worked through the beamhouse, tannery and currying shop in the same way, and you will find at least 25 per cent of them coarse. If the tanner will just take time and look closely into his beamhouse he will see that the hides or skins do not all get the same kind of treatment.

HIDES NOT UNIFORMLY TREATED.

In the first place, the hides or skins in the bottom of the soaks get more soaking than the ones on top. For instance, say you are soaking 300 skins or sides in a pit. The ones at the bottom get more pressure on them, which causes them to soften more rapidly than the hides on top. By the time the hides on top are soaked enough the bottom ones are soaked too much. Now go on to the limes. The lime is slaked, the arsenic is added and all put into the vat. The hides are then thrown in and allowed to lie twenty-four hours or longer. The lime will settle to the bottom and the hides at the bottom will be completely covered with lime sediment, and will come to the finishing table loose and pipey.

We know that in a system where reeling is done the hides on top today are on the bottom tomorrow, but the hides in the center of the pack get uniform treatment, and if the hides in the center of the pack were marked it would be seen that they would finish up better than the ones on either end. You will find this is true if you will watch your unhairing machine, or the men who unhair the hides or skins. You will see that they will strike spots on the hides where the hair comes very hard and it is almost impossible to get the fine hair off. These spots are where the hides did not get uniform soaking when they lay together in the limes. The lime could not get at the hides.

PLAN TO REMEDY THESE DEFECTS.

There ought to be some practical way to overcome these defects in the beamhouse. Why not hang the hides on sticks or racks and have a system of agitation, when the hides will have equal treatment? Or have a false bottom made of slots in the pits so that the lime could settle and allow the lime water to come in contact with the hides only?

If these suggestions were carried out it would require a little more room, but not so much as one would think, for if the hides were kept in motion or the limes agitated, it would require less time than it does now. Even if it requires more room and more power, what does the up-to-date tanner care so long as he improves his output and gets all No. 1 leather from No. 1 hides instead of 75 per cent No. 1, as he does now?

WORKING DRY HIDES FOR BEST RESULTS.

In working dry hides through the beamhouse, good results can be obtained by the following method: Dissolve 12 ounces of sulphide of soda to each 100 gallons of water. Soak the hides 24 hours, then take out and dry mill 30 minutes and pile down and cover well. Allow them to remain in the pile 24 hours, then put back in the same water they were soaked in first and allow to remain 24 hours. Take out and mill one-half hour and flesh. Then put into clean water over night and work from there into the limes. When hides that are cured with arsenic are worked, arsenic should be used in the lime. If they are sun-dried hides, sulphide can be used. The amount of lime and arsenic, or lime and sulphide, depends upon the condition of the water used.

PUERING HIDES AND SKINS.

From time to time various chemical products have been put on the market for the purpose of puering hides and skins. Some of these have been more or less of a success—usually less rather than more.

VALUE OF CHEMISTRY.

The tanner is indebted to the chemist for much that is helpful, and there is no doubt that were it not for the chemist we should still be groping about with no other guide in our work than the "rule of thumb," and especially is this true in the beamhouse work, but the chemist has his limitations and the raw product from which leather is manufactured is so variable that chemical experiments can not be depended upon unless carried out on a large scale. Not only does the raw material vary so much in substance and properties, but the processes in the manufacture of leather are so interdependent as to make the work of the chemist extremely difficult. Then, again, the chemist working independent of the factory seems particularly prone to wrong inferences and conclusions.

ACTION OF CHEMICAL BATES.

From the action of the majority of chemical bates which have been put on the market it would seem that the chemist looks upon the puering process as something carried on solely for the purpose of deliming. Now, this is but one of the things to be accomplished by puering. On most classes of stock it is necessary to so soften the skins that the short hairs and scud can be removed without injury to the grain. This is especially true in working goatskins. But in preparing sheep and calf for the chrome tannage no reduction of the skins is necessary.

PREFER CHEMICAL BATES.

There is no doubt but that any man possessed of his senses or at least one of them—the sense of smell—would prefer the use of a chemical bate to that of a bate made from animal excrement. Then, again, not only is the bate made from the animal excrement disagreeable to the senses but it is expensive and is dangerous as regards its liability to injure the skins by overdrenching.

Certain organic acids, such as acetic, lactic, oxalic and formic, have been used with considerable success. These aids are sometimes used alone and sometimes preceded by the usual puering or followed by the bran drench. One thing to be said against the use of these organic acids as a substitute for the manure bate is that the skins are inclined to be a little coarser and harsher on the grain. They are, however, as a usual thing, superior as regards plumpness and strength. On box dull and patent leather finish this is an important factor. The "piping" of patent leather has often been due to overreduction in the puering, and this is obviated by the use of the chemical bate. On certain classes of glaced stock, however, it seems imperative that one should use the manure bate. In certain instances the chemical bate may be successfully followed by a bran drench. The bran drench reduces the

skin, yet the flour contained in the bran attaches itself to the fibers of the skin and produces a peculiar and beneficial result. The effect seems to be that of a partially tanned skin. This can be imperfectly seen by holding the skin up to the sunlight, but to get a better idea of it one should put the skin under a glass.

ACTION OF MANURE BATE IMPERFECTLY UNDERSTOOD.

Although the action of the manure bate or of the bran drench has been but imperfectly understood, the most generally accepted and best substantiated theory is that the action is a bacterial one, and recently pure cultures of bacteria for bating purposes have been put on the market. These are giving excellent results, inasmuch as they not only do the work required of them, but they produce uniform results. In using a manure bate one freshly made does not reduce the skins as rapidly or make them as soft as does one which has been allowed to ripen for a few days, and not only are the skins placed in the new drench less soft, but they are quite certain to be cloudy. It has often happened that a colorer turning out fancy colors has been blamed for producing spotted stock when the fault has not been his at all, but rather that of the man who looked after the drenching. In puering the skins they should not be allowed to drench too low, since, if too much hide substance be lost, the skins cannot be properly filled in the tanning and the finished leather will be loose and break up easily when handled.

MULTIPLICATION OF BACTERIA.

The fact that hides from the decomposition of their tissues cause a multiplication of bacteria and that the theory held by some tanners in regard to the action of the bate, namely, that this action is caused by the ammonia salts and phosphates contained in the manure, is wrong, is proven by the fact that, having allowed a pack of skins to remain in drench until they run on the grain, it is impossible to use this drench again. Ammonia salts kill lime, but free ammonia takes their place. This free ammonia is as powerful as lime in swelling the hide, and therefore cannot account for the rapid reduction. An active bate swarms with bacteria, and the bacteria act not only on the organic matter of the dung, but on that of the hide producing acids, which neutralize and remove the lime and at the same time soften the hide by dissolving out the coriin and also a portion of the gelatinous fiber.

Old-fashioned tanners used to take their hides from the beamhouse after having been drenched and put them in old sour tan liquors. The hides were softened and any lime that might be in them was removed. It has been said by these old-timers that the old rotten liquors were good as a drench. While in these old liquors the hides required constant care to keep them from spoiling.

That the bacterial action of a drench is necessary for most classes of hides or skins there is no doubt. The action is such that the grain of a crusty skin and the coarse nicks can be worked down smooth by the use of a beamster's stone.

GOATSKIN NEEDS BACTERIAL ACTION MOST.

Perhaps the skin that needs this bacterial action most, both in the limes and drench, is the goatskin. Here we find a skin which in structure of fiber is very tight; it has also a naturally rough grain, and the tanner who thoroughly understands working down the coarse grain and having the grain of the leather finish soft and silky has a decided advantage over his competitor who does not understand this. Most manufacturers of goatskin leather use two drenches, the manure bate, called the puer, and the bran drench. Experience has proven that for a manure bate on goatskins the excrement of the dog takes the lead over that of the hen or pigeon.

PROTECTION AGAINST DISHONEST HIDE DEALERS.

Some tanners make a point of buying from one to several thousand hides or skins from one concern and putting a stamp upon them after unhairing. For instance, a tannery may buy from one hide concern 1,000 hides, and after unhairing stamp the letter A on each hide or on each side close by the tail, so as to be easily found. These hides should go through the tannery in regular packs, and when tanned and finished, should still be together, and if one thousand hides marked A came from the beamhouse, two thousand sides marked A should be accounted for by the foreman of the drying or finishing department. In tannery bookkeeping the purchase and full details of the thousand hides should appear at the upper left-hand corner of the book and various columns to the right should be used, containing history of the progress of the hides, winding up not only with their weight as marketable leather, but what they actually brought in net cash.

This is one of the very best methods for tanners to protect themselves against purchases of dishonest hides. If they learn, for instance, that hides from a certain dealer were not profitable to tan, the books might show that hides from another dealer always weighed out well and were profitable to use. No careful tanner should permit himself to be governed by guesswork. The amount of money invested is too heavy for any chances to be taken beyond ordinary business risks, and the honest hide dealer who treats hides fairly and squarely should get the patronage of the tanners, while the dishonest and tricky ones should be scrupulously avoided and allowed to keep the hides in their cellars.

KEEPING TRACK OF HIDE WEIGHTS.

If hides are bought in lots and upon arrival at the tannery are weighed and an account of the number and weights kept, it should be an easy matter to keep track of the hides as they are being manipulated in the various departments of the tannery.

Each lot should be numbered, the numbers being stamped on each side, close to the tail or on the head, before the hides are put in soak. The hides should be numbered 1, 2, 3, etc., and a record of each lot should be kept in a hide book. The record should state the selection of hides, where bought, with weight and price per pound. Date on which each pack was put into the soak should be entered and another item made when each lot is put into the liquor. By employing this system it is hard to see how a tanner can lose track of his hides.

CURING HIDES AND SKINS.

After hides have been removed from carcass, trimmed of meat, sinews, and tail bone, to get very best results double from head to tail along crease of backbone, flesh inside, and spread on floor to cool. This rids same of animal heat, thus preventing to a large degree heating and tainting after salted and packed. This also keeps the flesh side clean of dirt, blood, etc., preventing rust and iron stains and giving a better merchantable appearance. Then spread out hide or skin flat on dry floor, flesh side up, and stretch smoothly, being sure that no ends or shanks are allowed to remain folded under or on top. An extra pull should be given on each side below the brisket, widening out the hide as far as possible, making it spready. In branded stock this latter should not be done, as the hide should be made to look as plump as possible. Then cover with an even layer of fine or rock salt, just enough to cover all over. If only a few hides are to be cured, then place one on top of another, repeating the above on each. Generally fifty large hides or twenty-five skins can be cured in this manner on one pile. Where there are quantities the custom is to put in square pack, butt end always on the outside of pack, which is turned in about six inches. Sheepskins, however, should always be put on straight pile, one on top of the other, to lessen chances of heating and sweating, thereby causing stains. Extra care should be taken on sheepskins, giving plenty of salt to heads and shanks, which under ordinary conditions are neglected. The most essential part of curing hides and skins is to prevent their slipping the hair and thus spoiling the grain, and sometimes the whole hide, but if properly salted and not allowed to heat, either before or after putting in salt, this can be accomplished and the best results obtained. While the fact is not generally appreciated, a clean looking, bright hide or skin will always bring a premium in price over another, and oftentimes even helps to sell it.

SOAP FOR DRY HIDES.

Soak your dry hides for a couple of days in old salt water. Then mill up and put in a vat of water, and use the following:

Dissolve 14 pounds of salsoda, 2 pounds rock potash, 2 pounds saltpeter, 5 pounds glauber salts, ½ bushel of common salt, ½ bushel of slaked lime.

Have water enough to cover stock well and handle pack every day until soft, then resoak in fresh water, mill and flesh and put in the limes regular. In strengthening this soak use one-half the quantity for the next five packs. Then make up new liquor. This works very nicely on dry hides, making them equal to green stock.

IMPROVING BEAMHOUSE PROCESSES.

The necessity for studying raw material in the beamhouse is becoming more apparent to tanners every day. It is clear to them that to produce uniform leather the beamhouse must be closely looked after.

Frequently there is a falling off in quality of the finished goods, owing to some slight mistake. As a rule, the beginning of this mistake can be traced back to the beamhouse.

For chrome leather, if one is to have a uniform run of leather, the hides or skins must be brought forward to the tanhouse day after day in the same conditon. To be able to do this one must look closely after the soaking, liming and bating process.

The water has varying qualities in different localities and water has much to do with making fine goods. Before chemistry became an acknowledged aid to the tanner, each particular class of leather was best manufactured in that vicinity where the water was best adapted for that special product.

SOAKING.

In soaking green hides and calfskins the holding up of bellies and flanks so that they shall not be flabby and coarse when finished is quite essential. Hard water in the soaks is believed by many tanners to be best suited for the purpose. Hides are soaked for twenty-four hours, then fleshed on the machine and returned to the soaks for further softening. Liming is carried out in clean limes containing sulphide of sodium for hides and red arsenic for calfskins. The lime liquor is run into the sewer every other round and no filth is allowed to collect on the sides of the lime pit.

LIMING.

The amount of liming the hides or skins are to receive depends on the class of goods to be finished.

For patent leather a firm piece of stock possessing but little elasticity is necessary to take the daub and coat of varnish without piping.

In the liming of hides the split which is to be taken from the grain is quite a factor and many tanners believe today that the proper place to split the hide is after processing instead of from the limes. They claim that the fiber of the hide is not strained when split in a processed condition as it is when split from the lime and thus a finer finished split results. Others claim that they can get more weight in the split by splitting from the limes, since they are then not obliged to bate the split to kill the lime; simply washing it in water is ample, they say, and it may be then passed on to the bark liquors.

While hard water has proven itself to many to be best suited for soaking green hides and skins, it is a sad mistake to think such water is suitable for limed hides or skins as they come from the limes. Right here many a good job in the beamhouse has been upset. The hard water causes chalk of lime to form in the fiber, which oftentimes cannot be cleaned out by even very low drenching. Hides or skins containing this chalky substance tan hard in any tannage, and it is impossible to get a good clear color on the grain of such in the bark tannage.

COLOR ON GRAIN IMPORTANT.

The color on the grain of sole leather is important and it may be well to adopt the methods of some of our competitors who are turning out a superior article. One of the leading leather chemists in a sole leather tannery which has the reputation of turning out excellent stock uses borax in the soaks in which the hides are to be placed on coming from the limes. The water containing the borax is lukewarm, and after the hides have lain in this water three or four hours they are unhaired. It is claimed that by this process the hides are easily unhaired, a large portion of the lime is killed, and a fine, even colored grain is produced in the tannage.

VALUE OF BORAX.

Borax used in the rinse water on hides and skins for the chrome tannage even when the water is fairly soft makes a vast difference in the appearance of the finished goods, whether they are to be patent, dull or bright.

In liming calfskins, since most calfskin leather is finished into mat, velour or boxed finish, a little more zinc is needed to the fiber and somewhat softer grain than for patent.

While sulphide of sodium is somewhat like red arsenic in its action, in that it attacks the hair first, yet it does not have the permanent softening effect produced by red arsenic. Where red arsenic has been used, the leather holds soft and silky while lying in stock, whereas in many cases where sulphide of sodium has been used the finished stock has grown hard after a little time.

On coming from the limes skin should not be left exposed to the air longer than necessary. The grain of the skins on coming from the limes is rough and harsh, the action of the lime having caused this. Prolonged exposure to the action of the air causes the lime to crystallize and form what is known as "lime blasts." These spots on the grain are rough and harsh, and it is difficult to unhair the skins without scratching. These spots are also difficult to tan; then when the skins reach the coloring stage it is found that the dye does not penetrate and the dyer resorts to chemicals to make the dye color these spots. On black finished goods this might do, but on fancy colors this defect cannot be covered up.

BATING.

In bating this class of goods many tanners still hang to the old way —the manure bate first, followed by the old bran drench. Such a method of drenching is difficult to control, since the condition of the atmosphere is constantly changing, which results in a more or less active bacterial bate. Others use either a latic or a boracic acid bate first and then place their skins for a few hours in a bran drench. In this manner they claim that a uniform product is produced and that the little bacterial action in the bran drench makes a fine break on the grain of the finished goods.

TO GET BEST RESULTS IN BEAMHOUSE.

The expert tanner of today is not the one that can come nearest to the danger point without spoiling a lot of leather, as was the case a number of years ago, but the one who knows how to avoid the danger point and bring out a uniform product.

The man who thinks and who studies his work cannot help finding out many new things concerning any particular kind of stock which he may have in process of manufacture.

The advance made in calfskin leather the past few years has brought out a leather which is durable and handsome and a strong rival of glazed kid.

It has not been a great many years since it was believed that the grain of a calfskin was so tender that the leather could only be finished on the flesh side, but modern methods of handling the skins through the beamhouse and the better understanding of tanning materials has changed all this, and today, instead of the calfskin being finished on the flesh side, it is finished on the grain.

The discovery of the combination and chrome tannages made a radical change in all leathers, but most of all in calf. The tanning and currying of the old wax calf was carried out in an irregular manner. In the liming of the skins all that was considered necessary was to

have the hair start easily, and but little attention was paid to producing a uniform product. As a general thing, when wax leathers were the prevailing leather, tanning and currying was each a trade by itself. The tanner knew but little if anything about currying, and the currier little about tanning. When things went wrong, each blamed the other, and the owner of the stock was obliged to stand the losses.

MISTAKES IN THE BEAMHOUSE.

One of the worst mistakes made in the beamhouse is to hold a semi-annual cleaning out of the limes. Many tanners today do this and then wonder why there is so much variance in the finished goods. For most classes of upper leather a weak old lime is needed on the start to insure fine grain. The action of lime on the grain of a skin is somewhat like the action of bark liquor, and tanners are very careful that no strong liquors come in contact with the drenched green skins on the start. The same rule should be carried out in the beamhouse—weak limes on the start, followed by the stronger.

The limes should be cleaned out in rotation, and in this way a sudden change in liming methods which would show all through the tanning and finishing departments is avoided. It is found in practice that old limes have a different effect on skins than freshly made ones. This is due to the solvent action of ammonia and bacteria; up to a certain point this bacterial action is beneficial for its softening effect, but if carried too far, loose, flabby grain results.

The old lime liquor is valuable for the ammonia and organic matter it contains, which act rapidly on the hair cells, without swelling the skin.

LIMING.

For liming calfskins which are intended for fancy colors, red arsenic, mixed with the lime, gives, without loss of hide substance, a fine close grain, with the required stretch so necessary in this class of goods.

In the combination tannage considerable salt and alum is used in the tanning, and to carry and hold the necessary amount of salt and alum the liming and drenching must be carried out carefully.

Red arsenic attacks the hair first, and if it be depended on as the depilitant trouble will be encountered all through the works. Lime attacks hide substance, the combination working together makes an ideal depilitant for most fine leathers.

If too much red arsenic be used and not enough lime, the skins cannot carry the salt and alum and the crystallization of these substances will show on the grain after the skins are dry. Many have thought this crystallization due to an excess of salt and alum, but this has not been the case.

It has been proven many times that the ordinary amount of salt and alum causes this spue, if not enough lime has been used for depilitation.

This is due to the inability of the skin to absorb the tanning materials, even in small amounts, and is known as "white itch." This form of spue must not be mistaken for the ordinary spue, which is caused by an excess of salt and alum and intensified by improper drying. The latter form of spue may be easily recognized by the tanner by its coarseness. The spue known as "white itch" is not the only trouble noticeable in leather which has been improperly limed. It is not elastic, colors hard and is flat and tinny. This is due to the fibers of the skin not having been split up in the liming, although the hair may have started easily in unhairing. This is often the case where too much red arsenic and not enough lime has been used in the liming process.

TO DISSOLVE RED ARSENIC.

The proper way to dissolve red arsenic is to mix it with the limestone while the lime is slaking. For some reason the skins unhair more rapidly when the lime and arsenic have been dissolved in this way than when each has been dissolved by itself.

The unhairing of calfskins is accomplished mostly over the beam instead of by the use of the unhairing machine.

The oil used in the tanning of fancy colored calfskins is quite a factor and when we come to the consideration of materials to be used for the purpose, cod oil perhaps stands first on the list. There are other things which are cheaper as to first cost, and which will, perhaps, for a time, give that mellow feeling so desirable in all leathers, but mellowness produced by these things has not the permanency of that produced by cod oil, and, all things taken into consideration, cod oil will be found to be the cheapest in the end. Either in a raw or in an emulsified state it is readily absorbed by the leather. In addition to the mellowness that it imparts, it gives an excellent body, permanently nourishing and strengthening the leather, and is a tannage in itself.

COD OIL OFTEN ADULTERATED.

Cod oil is a much abused article, being adulterated in many ways. Perhaps one of the most common adulterations is menhaden oil, which is extracted from the body instead of the liver of a certain fish, and has most disagreeable gumming properties. It is almost impossible to detect this oil, and, as the evil effects do not appear at once, the tanner is left very much at the mercy of his dealer in oils.

Instead of buying any of the cheap so-called "cod" oils, one had better buy menhaden and paraffin oils and combine the two himself. The paraffin cuts the glutinous matter contained in the menhaden and renders it less liable to gum the leather.

There is a very tenacious glue made from the body of the fish and considerable of it is contained in cheap grades of cod oil. When this is given to the skins in the state in which it comes to the tanner it collects on the grain. As a general thing, the skins are hung up to dry after the oil has been milled into them and this gluey substance remaining on the grain makes it absolutely impossible to get an even color. For this reason, unless cod oil is known to be absolutely pure, it had better be cut with an alkali to dissolve this glutinous matter and given to the leather in form of a fat liquor.

GOATSKINS FROM BEAMHOUSE TO FINISHING.

In handling goatskins from the beamhouse to finishing room one finds a raw material that must be handled in a different way from other skins. The goatskin naturally is of coarse grain and light texture, the texture and coarseness varying according to the section of the country from which the skins come.

To obtain the best possible result in the manufacture of glazed kid a manufacturer must confine himself to a certain class of raw material. In this way he soon learns its peculiarities and the manner in which the skins should be worked.

TIME AND EXPERIENCE NECESSARY.

Time is required even under the best of conditions for a new tanner and finisher of any class of goods to be able to understand how to work the skins in all departments satisfactorily. When a tanner starts up a new tannery for the purpose of making soft grain stock which should possess considerable suppleness, the first few packs do not show the suppleness and mellowness so desirable in this kind of leather shown by following packs after the limes have become a little old. This has surprised men who have worked in the beamhouse many years under a foreman and have had good working knowledge of the beamhouse processes, but have never had a chance to put their knowledge to the test. Such men on going to another factory to take charge in starting up a beamhouse have been surprised at the difference in appearance and feeling between the drenched stock of the old and new factories, knowing that the methods in the factories have been the same. When asked to explain why the stock is not up to the standard they of course are unable to do so, but as the stock improves daily until it is all that can be asked for, these men generally hold their positions. In liming goatskins more bacterial action is needed for the fiber than on any other class of raw material, and this is also true in the bating, or puering, process. For this reason old limes containing organic matter should be used.

LIMING.

Men who are thoroughly familiar with goatskins, in starting up the beamhouse anew, add a pail or two of old blood or some like material to the lime liquor to start up the right bacterial action. This not only starts the bacteria to working but it takes the harshness out of the lime. It is proven in practice that hide substance is not alone dissolved by the lime and red arsenic, but also by the organic matter produced in old limes by the dissolved hide substance itself. To get the best results in liming goatskins a weak old lime is used on the start, followed by the arsenic limes. In this way the grain is kept down and is not made harsh. Although hide substance is dissolved by both lime and decayed hide substance yet the action on the skins by these two substances is different. Decayed hide substance has no plumping effect. On the contrary, its depleting effect in a lime liquor is not unlike the action of a drench. It is more powerful in its depleting action than lime. The older the lime the greater is the percentage of bacteria, and consequently the greater the solvent action of the limes on the skins. Hence, as the dissolved hide substance contained in an old lime liquor has greater softening and unhairing properties than lime, it is much better to use old limes for goatskins.

Owing to the tight, grainy texture of the goatskins there must be a reduction by puering to obtain a silky grain as well as to free the skins from lime. Chemical bates at this stage will not do, since in the chemical bate the skins hold their own and in some instances even plump.

The action of the puer or drench on the skins is through fermentation. As I have said before it is a well known fact that after a short time the organic matter of the skins themselves will so pollute the limes, the water, or the tan liquors that they will act in much the same manner on the skins as does the drench. Then, again, it is also known that a new puer made from animal excrement—no matter how strong it may be—will not reduce the skins as rapidly or make them as soft as will one a few days old. A new puer started from water containing a boiled solution of excrement extracted the same day always makes the grain of the skin cloudy and harsh.

ACTION OF BACTERIA.

That hide tissue furnishes bacteria in the drenches is proven by the fact that if a pack of skins be bated so low that they are run on the grain because of having the liquor too warm, the next pack will come out in a still worse condition even when no heat has been used. Since bacteria swarm in an active bate, there can be no doubt that the process is fermentative rather than chemical.

The bacteria act not only on the organic matter of the dung but on that of the hide substance. This neutralizes the lime and at the same time softens the skins by dissolving portions of the gelatinous fibre.

Goatskins must be thoroughly stoned to remove the scud, fine hair, etc. The stoning not only removes all filth but it also cuts down the coarse grain making it fine. The stoning may be done either by machinery or by hand over the beam.

AVOIDING COARSE GRAIN ON GOAT LEATHER.

The time and place to cut down the coarse grain on goatskins is after the skins have been puered or bated. Here the grain is in a soft, silky condition and gives readily under the slate. The "slating" is an important part of the beamhouse work. It not only removes the coarse grain, but the scud and short hairs also. Morocco finishers well know the importance of putting out in good shape a tanned skin which is of coarse grain to have it finish fine, and it is of greater importance to work down the coarse grain after the skins have been bated. The slate or stone gets down into the body of the grain and does not scratch or cut as would a tool made of steel or some other hard substance.

SLATING.

When the skins are taken from the bate to be slated they should first be placed in a tub of warm water handy to the workmen. The warm water not only keeps the skins soft, but by its use the little pebbles, which get into the bate liquor even when the utmost care has been exercised in dissolving the excrement, are washed off the skin. These pebbles are sharp, and when the slate strikes them not only is the grain of the skin scratched but the edge of the slate is nicked. This in its turn scratches the grain of the following skins if it is not looked after. For hand work over the beam the slate should be oval in shape so as to conform to the beam, and should be ground to a slanting edge similar to that on a carpenter's chisel. Although the edge is fairly sharp, if enough bolsters have been placed on the beam, and the workman understands his business, there will be no nicked grain. It will be found that the edge will readily take hold of the short hairs and the coarse grain cut away with half the expenditure of labor that there would be if a square-edged tool were used. After the skins are slated they are ready for the drenching.

DRENCHING.

Many tanners are still using the old bran drench after bating instead of an acid drench. In the making up the bran drench sufficient water should first be run into the drench vat, then the necessary amount of bran put in, a pail or two of sour bran from the previous drench added, and the whole well cooked by the use of steam. Sometimes in a case where the beamhouse has but recently been started up and there

is no sour bran at hand, a gill of vitriol or a yeast cake will be found useful in starting the drench to souring. As heat is a great factor in helping the drench to sour it is much better not to run it up with water and cool it down to the necessary temperature until the skins are ready to be entered. The skins should be placed handy to the vat so that all may be in as quickly as possible and get an equal degree of heat. Two or three men should be set about putting them in, since if only one man takes hold some little time elapses between putting in the first and the last skins, and by the time the last one is in the liquor has cooled several degrees.

After the skins have been placed in the drench the vat should be covered up to retain the heat. If the drench has been properly made up it will commence to work on the start, and as it works the skins move over one another and finally come to the surface. The following morning they are generally up solid on top of the liquor and need sinking down to insure even drenching. After a little the skins are again on top of the liquor and once more are sunk. If it is then found that the skins are not working towards the surface they must be taken out, washed in warm water and made ready for the tanning.

TWO BATH PROCESS.

For goatskins the two bath process makes a finer piece of leather than does the one bath, since in this class of raw material the fiber is very tight and needs considerable splitting up. In tanning goatskins six pounds of bichromate of potash, three pounds of muriatic acid and eight pounds of salt are used for 100 pounds of pelt. The salt is a valuable addition, as it controls any free acid there may be in the bath. Chromic acid may be used instead of potash and muriatic acid and get the same result, but the salt must be used in either case. The skins are drummed in the chromic acid solution until the yellow has penetrated the thickest part of the skin. The skins are then horsed up and left over night to allow the chromic acid to set in the skin. Tanning the skins does not mean simply coloring them through so that they show yellow; they must lie a number of hours on the horses to mellow. Care must be taken that they be not left exposed to any draught of air by which the edges may be dried and also that they be protected from the light.

In reducing the skins from chromic acid to oxide of chrome care must be taken that the reduction be not too rapid. If the soda solution is given to the skins too strong or too fast drawn rubbery grain results, which cannot be put out either by hand or by machine. It is much better to dip the skins in the old hypo solution from the previous pack, and then after draining finish out the reduction in a stronger liquor.

IMPROVED TREATMENT OF RAW HIDE.

For the treatment of the raw hide, both before and after entering the liquor, tanners have employed many methods. All tanners well know that nothing is easier than to tan only the surface of the hide, and that it is also an easy matter to close the pores and thus retard the tanning liquor. Perhaps this effect was most noticeable when tanners first commenced to use extract of hemlock bark. At that time it was not understood that an extract indicating 10 degrees by the barkometer was as strong in tannic acid as a 15-degree bark liquor, and, furthermore, it was not generally known that the extract liquor contained a resinous matter which clogged the pores and thus excluded the tanning material.

THE OLD METHODS.

In the good old days tanners supposed that the only way to prevent clogging of the pores and the drawing of the grain was to place their hides in old, sour liquors, which in reality was hardly more than a drench, since such liquors were full of organic matter. This opened the pores and softened the hide, but, if carried too far, great damage resulted to the leather.

At one time perforation was proposed as a means for hastening the tanning of the hide, but this was not found to be practical. It was tried to some extent in the manufacture of sole leather. The hide was punctured on flesh and grain by means of fine needles until it became almost sieve-like. One large tanner of sole leather tried the scheme on a few hides. He found that they tanned rapidly and on being rolled under the rolling machine no one could detect that the hide had been punctured in any manner. The expense, however, was heavy, and the scheme was given up.

VACUUM TANNING.

About that time vacuum tanning for heavy leather was talked up to quite an extent, and some tests in this direction on a small scale seemed to be satisfactory. One firm built large square tanks of heavy plank. These were lined with copper to make them air-tight. Two pumps were connected with the tanks for the purpose of exhausting the air. The hides were then hung in the tanks, the tanks closed and the pumps set to work to exhaust the air in the tanks. The suction, together with the outside air pressure, was so great that the tanks bulged in great shape. The liquor was allowed to rush in and then things were left for a few days. When the liquor was run off the tanks opened and the stock examined, it was found that in exhausting the air the green hides had stuck together and the result was a lot of spotted, unevenly-tanned leather. This was given up as a bad job and the firm returned to the old method of tanning.

BARK LIQUOR STRENGTH.

Experienced and successful tanners will tell you that the strength of a bark liquor should depend upon the condition of the grain of the hide when it enters the liquor. If the grain of the hide has been reduced by the action of the drench until it has a soft, silky feel, and fine, soft leathers are to be made, the hide will not stand too strong a liquor. Such a liquor would pucker the grain and close the pores. On the other hand, if the grain has not been reduced to the condition mentioned above, a liquor which would draw and blister the above mentioned hides would not injure the grain of the latter in any way. This fact is taken advantage of by tanners today who make the different buff leathers. Since the grain of the hides for these leathers is in a rigid state when ready for the tanning, they may be subjected to a fairly strong liquor.

BETTER HANDLING OF GREEN STOCK.

Many tanners today who make light leather from kips and hides say that for fine, firm leather it is all nonsense to talk about placing the green hides or skins in old weak sour bark liquors, claiming that such liquors cause the pores to open and to become coarse. They also claim that to make good leather the green hides must commence to tan as soon as put into the liquors and then fed gradually until tanned. To accomplish this all filth from the beamhouse must be left behind, the hides or skins being washed perfectly free from all organic matter left in them from the drench.

PADDLE WHEEL BETTER THAN DRUM.

For the purpose of cleansing the skins by washing in water the paddle wheel is much better than the drum, since when green stock is in this condition the drum pounds out more or less hide substance. It is also claimed that the green stock plumps in cold water, putrefaction is stopped, and because of this there is a larger saving in tannic acid and the danger of drawing the grain is reduced to a minimum.

Many tanners who split the green unhaired hide in the beamhouse so that the grain may be used for the chrome process of tanning and the remainder of the hide known as the split for hemlock tanning are confronted by a new condition. They find that as soon as the split comes in contact with the tanning liquor it curls and shrinks. This occurrence is due to the fact that the flesh side is not affected by the liquor in the same manner as is the section of the hide exposed by the splitting. This middle section of the hide, which is in this case exposed to the liquor, differs from both flesh and grain in that its fibers are less closely interwoven and that it possesses more coriin or cementary

tissue and less corium or connective tissue. This is the portion of the hide affected most in the liming and drenching. The more prolonged these operations are the more coriin or cementary tissue is dissolved.

TO OVERCOME CURLING OF SPLIT.

To overcome this curling of the split, and to have a given number of pounds of weight in tanned or finished wax leather all possible hide substance must be retained in the liming and reducing in an animal bate must not be thought of. A drench made from the excrement of the dog, the hen, etc., is not suitable; neither is one made from bran; but a drench made from lactic or boracic acid is suitable. In many cases, since there is no grain to crack and split a good washing in water in the paddle wheel and then suspending the green stock in the proper sour vegetable tan liquor the lime may be overcome.

EXTRA CARE IN SOAKING, LIMING AND DRENCHING.

In tanning the hide before it is split two compact surfaces are presented to the liquor—the flesh and the grain—and the leather tans smoothly. When the hide is split green only one compact surface is presented to the liquor, and that the flesh. This is of close fiber and is the strongest part of the hide. It is not affected by the tannic acid to such a degree as is the soft, gelatinous matter of which there is so much in the inner portions of the hide. This substance is easily affected in all the beamhouse processes, also in the tanning process. Therefore extra care must be taken not only in the soaking, liming and drenching, but in the tanning liquor as well. There, also, something in the chemical line must be used to prevent the soft, tender portion of the split from being acted upon so harshly. Borax used in the first liquors is giving excellent results.

TANNING SKINS FOR MATS.

In many cases in tanning hair skins of a greasy nature for mats, etc., it is not safe to use alone a tannage such as is derived from bark or any vegetable matter, as the grease in this case will retard the tannic acid. To overcome this difficulty, a combination tannage is necessary, made from salt, alum and bark, or gambier, to which a little saltpeter or borax is added to drive the liquor into the skin. Dogskins, especially if they have been taken from the animal's back when he was fat, are very greasy, and great care must be taken to remove the grease both before and after tanning. Care should be taken to set the roots of the hair firmly when tanning. Unlike most hair skins, the roots of the hair in a dogskin come through to the flesh, and, if the workman is not careful when fleshing, these are easily cut.

There are various ways of killing the remaining grease in a dogskin after it has been tanned. Some depend on a strong alkaline solution; others use whiting or fuller's earth on the flesh side. The most practical way is to hang the skin in a naphtha tank. If a person has not the facilities for doing this himself, there are men who make a business of removing grease from skins tanned with the wool or hair on. In this manner all the grease in the hair or wool and pelt itself is removed. There is no skin, perhaps, which will in a short time throw off such a foul odor as a dogskin if the grease is not thoroughly removed. For this reason many women will not have a dogskin rug in their homes.

SCOURING WOOL.

In scouring wool one should be located where an abundance of soft water is supplied. Washing the wool being the first process in woolen manufacture, it is important that the wool be thoroughly cleansed, yet not burnt in the scouring. Strong soda ash solutions should be avoided. The caustic agents have too strong effect upon the wool fiber, making them weak and tender and of brownish color. When once this damage has been done it cannot be restored, as the fiber has lost the luster and suppleness for good spinning. It is all-important that the luster and suppleness of the fiber should be retained, hence the value of soft and mild scouring agents.

HAIR CALF.

Perhaps the most delicate skin to dress with the hair on is the skin of an unborn calf. It is a delicate job to remove the skin from the animal's back in the first place. Butchers who now and then skin one of these calves say that they are obliged to do the operation in a tub of water. So delicate is the skin that the tanner must be very careful how he handles it, both before and during the tanning process. Even when first received, it is a very easy matter to start the hair with the thumbnail. The skin cannot stand any fleshing in the beamhouse. All that is possible with such a skin is to give it a rinsing in water and immediately place it in the tawing liquor to set the hair; but this tawing liquor must not be very strong. Since the skins are used for fancy slippers, etc., they must be tanned softer and have more elasticity than is necessary for a skin intended for a rug. These skins are tanned in the glove leather tannage, that they may be white not only on the flesh side, but, as the mottled ones are chosen in the raw state, that the white hair in the skin may remain white also.

In washing such skins after tawing only a weak solution of suds is necessary, made from hard soap. Strong potash soap should be

avoided, as there is danger of starting the hair if such soap be used. After the skin has been dried from the washing it should be slightly dampened on the flesh side with water, left to sammy for a day or two, and then arm-crutched in the perch.

Before the crutching knife is used the skin should be well worked by hand in the manner that an alum tanned skiver is worked; that is, all possible stretch must be taken out. Then the crutching knife can be brought into play, taking good care that the skin is not cut through. After the skin has been crutched in the damp state it should be dried, and, when dry, a second crutching given, to further soften the skin. It is then ready to be buffed; that is, to have the loose flesh removed.

FINE EMERY WHEEL SHOULD BE USED.

The skin, being very thin, is too delicate to place on a coarse emery buffing wheel. Only a wheel covered with a special fine emery should be used. After the flesh is removed the skin should be given a good brushing by hand on the hair side, to remove the dust that has collected on it, and to open the hair where it has matted together. Many beautiful skins are sometimes found in their natural colors, some in stripes of black and white, some in brown and white, and others mottled.

SUCCESSFUL BEAMHOUSE WORK FOR CALFSKINS.

Take 150 9-lb. to 12-lb. green salted skins, wheel them in a large wheel with plenty of water for an hour; this to get all the salt out of them. Now put the skins into still pits with clean cold water; let them soak for 18 to 20 hours; trim and clean. Then work these skins in an old lime, 2½ or 3 per cent broma. Allow in for two days, then haul and add 100 lbs. white lime and 3 pounds arsenic. At the end of fourth day add 50 pounds more lime and half the arsenic. Repeat this on the eighth day; haul out at the ten days, if in the judgment of the beamster they are right. This work must be left to the man in charge. The skins should show plumpness, hair slip easily and good feel all over free from bone. Now lift, remove the long hair, wash, flesh and short hair. Now the skins are ready for bating. Dog, hen, pigeon manures are used; hen manure preferred. Take two bushel and soak over night, strain, add to paddle wheels, having the same three-quarters full of water, warm; drench four or five hours. Here again is where the skill of the man in charge is required. The skins are then taken out, washed for ten to fifteen minutes, and are now ready for tan, or they may be held by pickling them in acid and salt.

BEAMHOUSE WORK ON SOLE LEATHER HIDES.

A method which is sometimes employed, but which is not in general favor among tanners, is to suspend the hides in a solution of sulphide of sodium; lime is added to this solution, which saves putting the hides through the limes after unhairing. The length of time which the hides should remain in the solution is determined not alone by the starting of the hair, but by the raising of the flesh.

No matter what process is employed for starting the hair, it must be removed by some mechanical means. The old method is the hand process over a slanting beam with a double-handled knife called the worker. Today most of the unhairing is accomplished by machinery.

MILL HAIR OFF IN A PIN WHEEL.

Some tanners, after the hair is thoroughly reduced to a pulp by a sulphide of sodium solution, mill the hair off in a pin wheel. Few experienced and successful tanners consider this advisable on hides intended for sole leather, although it does very well for lighter leathers. A chief consideration in sole leather is weight, and since at this stage the gelatine of the hide is in a partially dissolved condition, the shaking up which it gets in mill causes a considerable loss in weight; it also makes the leather soft and spongy. These losses overbalance any saving which is made in time and labor.

Some tanners, endeavoring to give their hides the minimum amount of liming, find that although the long hairs are readily removed the short under coat fails to start and must be shaved off with a sharp knife when worked out. The extra labor cost for this is considerable.

ANIMAL BATE INJURIOUS.

While it is necessary that all hides intended for sole leather should, after unhairing and fleshing, be well cleansed from the depilatory agent, it is not advisable that such stock should be subjected to a bate made from animal excrement. Such a bate destroys a large percentage of the gelatine of the hides.

Lactic acid used in a paddle wheel for freeing the hides from lime gives good results, also does sulphurous water; that is, water charged with the fumes of sulphur by the use of a sulphur machine. Such treatment makes the hides white and clean, and so distends the fibers that the grain takes on a nice even color when put in the tan liquors.

PATENT LEATHER BEAMHOUSE WORK.

In tanning hides or skins for patent leather by the chrome process, the beamhouse work is most important. In depilitating the hides or skins care must be taken that no undue swelling of the raw material

takes place. In the chrome tannage the patent finish is applied to the grain. In many cases tanners blow their hides by using sulphide of sodium in new limes. In this manner a thick grain is produced, which "pipes" when finished, although the hide fiber may show under the microscope to be close and split up but little.

In cases where the grain has been kept from rising and the body of the hide kept from plumping too much, the finished leather shows a compact fine grain, free from any "pipe," yet under the microscope we find the hide fiber split up to a far greater degree than is the leather which "piped" but had a very close fiber in the body of the hide.

THE SOAKING OF GREEN SALTED HIDES

for chrome leather needs to be carried out in such a manner as to hold up the bellies and flanks. To do this, clean soaks made from hard water should be used. Borax in the proportion of 5 to 8 pounds to 1,000 gallons of water will prove to be beneficial. By its use the dirt and dried blood in the hair is dissolved and the grain is made soft and silky, allowing the lime liquor to readily attack the hair sheaths. The hides are generally soaked for 24 hours and then fleshed on the machine. After fleshing they should be returned to the water pits and left until the next day, when they should be hauled from the water and toggled by tying the neck of one side to the butt of another by ropes.

It is important that the sides go into the first lime smoothly, or it will be hard work to reel them into the next lime smoothly; then again, if reeled into the limes in a slipshod manner they will not lime uniformly.

The fleshing of the hides when partly soaked removes the loose flesh and fat, breaks up the tissues and insures a more even soaking and it also insures a more even and rapid liming.

It is a good plan to spread the sides down smoothly in piles for a few hours to allow them to press before placing them in the limes.

LIMES SHOULD BE MELLOW.

Many make the mistake of having the limes too fresh, or, in other words, newly made. The limes used for hides intended for patent leather should be mellow, but not old. Old limes rapidly deplete hide substance and also keep the hides flat. While it is necessary to keep the limes clean and free from decaying hide substance by frequent running of the liquor into the sewer, yet some six inches of the old lime liquor must be kept in the pit to take the harshness from the newly made liquor. In using sulphide of sodium, since it is a product of muriatic acid, much better to use it in the lime liquors. The alkali in the lime neutralizes the acid and through the decomposition of the sulphide caustic soda is formed which works rapidly on the hair sheaths.

RED ARSENIC USEFUL.

Red arsenic used in the lime liquor works somewhat differently than does the sulphide. It has a tendency to keep the grain from rising and to keep the skin flat. Red arsenic is useful on all stock which is to be glazed, since a brighter gloss can be brought up under the glazing machine by its use. Red arsenic should be dissolved with the lime while the lime is slacking. It has been proven in practice that by dissolving the red arsenic with the hot lime while it is slacking better results are obtained than by dissolving the arsenic by itself. Red arsenic and lime as depilitants differ in their action on the structure of the hide or skin. Lime works on the tissue, dissolving it before attacking the hair. Red arsenic attacks the hair first and if depended upon as the depilitant trouble is encountered all through the tanning and finishing. Through the use of both lime and red arsenic the hair is ready to start easily and enough hide substance is dissolved before the hide is depleted too much.

The rinse water used on the hides or skins as they come from the limes should be no colder than that of the lime liquor.

Soft water should be used for rinsing, since if the water be hard the grain of the hides or skins is liable to be roughened in the unhairing.

LIME CAUSES ROUGH AND HARSH GRAIN.

The action of lime on the grain of hides and skins causes the grain to be rough and harsh and if the limed stock be placed in hard cold water not only will the short hairs and scurf be set in the grain, but the lime will be fixed in the fiber. The place to rid the grain of scurf and short hairs is in the unhairing. Before allowing a knife to be used on the grain, either by hand or by machine, the lined hides or skins should be allowed to deplete a little.

Many tanners today place the limed hides or skins in warm soft water containing borax in the proportion of 8 to 10 pounds to 1,000 gallons of water. The borax helps to kill the lime and helps to make the grain soft so that in the unhairing the short hairs give readily as well as the scurf.

In the drenching or bating of the skins many different kinds of bate are used. Some tanners use a chemical bate, others use a manufactured bacterial one and still others hang to the old manure bate and will use no other. Perhaps the most common bate used is lactic acid, and if one wishes to get a bacterial action it is an easy matter to add a little glucose. If a bacterial bate be used it is a good plan to wash the hides or skins in warm water containing a small amount of boracic acid. By its use putrefaction is arrested, the remaining lime in the raw stock is neutralized and a smooth, mellow grain is produced.

VALUABLE SUGGESTIONS FOR LIMING.

In depilating hides and skins for the different tannages and finishes the leather manufacturer must bear in mind many different things. He must thoroughly understand the raw material, the action of both the vegetable and the chrome tannage on the fibers of the skin and be able to so depilate that when the hides or skins are ready for the tannage the fibers are in condition to receive it.

It has been demonstrated many times that the action of a tanning material on the fibers of a skin differs according to the manner in which the skins have been limed.

For combination tanned leather, if the stock has not been sufficiently limed, the fibers of the skin cannot carry, nor can they take up the ordinary amount of salt and alum which is necessary to tan them and instead of being taken up by the fibers of the skin the salt and alum remains on the grain in a crystallized state often called "spew."

One would naturally suppose all tanners to be thoroughly conversant with the object to be attained in liming hides and skins, yet this is not the case. Many seem to think that the sole purpose of liming is to start the hair so that it can be easily removed from the grain. This is the sole purpose in some cases; in others it is not.

DIFFERENCE IN LIMING.

There is quite a difference between liming for glove and sole leather. In the case of glove leather a prolonged liming is necessary, not alone for depilating purposes, but to split up the fibers of the skin so that they can move over one another in either direction. Elasticity and softness are the essential features of this stock and this is carefully borne in mind during the liming process. The length of time allowed by tanners to thoroughly lime skins for glove leather depends on the raw material and whether the grain is to be removed. Three or four weeks in the limes are given to many kinds of raw material.

IN LIMING FOR SOLE LEATHER

the hides are depilated only so much as is absolutely necessary to break up the hair sheaths sufficiently to enable one to remove the hair, since weight and solidity are the essential features of this stock. For this stock a quick sharp lime is used, and as soon as the hair starts readily the hides are removed from the lime.

IN LIMING FOR SHOE STOCK

the process must be carried out according to the nature of the raw material and the tannage to be applied later. It is absolutely necessary for the tanner to know the nature of the skins he is working, since the

method of liming necessary for one may be utterly unfit for another—the tight, compact skin needing different treatment from the soft, open one.

Today we have the bark, the combination, and the chrome tannage in general use, each acting differently on the fiber of the skin and each requiring different treatment in the limes. Stock that would finish fine from a bark tannage would be soft and mushy tanned in the chrome. The bark tannage fills, the chrome does not, and this must be borne in mind while liming.

FOR CALFSKINS

which are to be tanned in bark and finished for wax leather a white lime should be used, and the stock merely limed enough to give it a little suppleness and to allow the hair to start easily. The amount of grease that calfskins can carry in the finishing depends on the manner in which the stock has been filled with bark, and skins which have been much depleted in the liming cannot be properly filled with bark and will be soft and mushy.

FOR THE DONGOLA OR COMBINATION TANNAGE

a different treatment in the beamhouse is called for from that given wax calf. This stock is finished on the grain instead of the flesh; it is not filled with grease and a more supple leather is called for.

For stock on which it is desirable to keep the grain soft and silky, and to remove some of the hide substance, red arsenic is used in connection with lime. The red arsenic is an important factor where stock is to be finished on the grain. Its usefulness has long been known to alum tanners and today it is in general use by all tanners of upper leather. Its action on the skin is beneficial in many ways. The hair is loosened more readily than when lime alone is used, the stock is kept from swelling, the grain is kept soft and silky, and in the finishing room a deeper and brighter gloss can be brought up under the glazing machine than could be were no arsenic used. The softening effect of red arsenic is greater in an old than in a freshly made lime, and it is proven in practice that the bacterial ferments contained in a lime are beneficial in many ways, the finished product limed in a reasonable old lime being far ahead of the stock limed in freshly made limes. (This applies to goatskins for either the chrome of combination tannages and to calf for the combination.) This fact is noticeable in the finished product of a factory that has recently started up, the product lacking the mellowness and silky feel which is shown in the finished leather a little later on. Some who thoroughly understand this point start the bacteria to working in the limes of a new factory by putting in a bucket of decaying blood or some other like substance.

DIFFERENCE OF ACTION IN NEW AND OLD LIMES.

The action of a new white lime on hide substance is far different from that of an old one. In a new lime started from water the hides or skins plump readily and a longer time is necessary to get the stock into condition for unhairing, since in the new white lime the lime alone must do the work. In a fairly old lime the organic matter produced from the dissolved hide substance is a powerful factor in the depleting process. Although it has been proven that hide substance is dissolved by both lime and the organic matter contained in an old lime, yet the action on the skin from these substances is far different. Lime first swells the fiber and then works on the tissue. Organic matter has no plumping effects and is more powerful in depleting than is lime. Now, the older the limes the more bacterial ferments they contain, and the greater the solvent action on the skins. The length of time to use these gathering limes depends upon the amount of bacteria they contain. When they have reached that stage where their action is dangerous to a hide or skin, the man of experience knows it and shifts his lime liquor.

IN LIMING SKINS FOR CHROME TANNAGE

very few men succeed in getting out an even product on skins of a soft nature, such as calfskins, sheep and cabaretta. In the tannage on this class of stock, all hide substance must be held in the beamhouse or loose grain and mushy bellies will be the result. There is no filling matter in the chrome tannage; it only cures the fiber, but, unlike all the other known curing processes, it cannot be washed out after having been dried.

IN HANDLING SHEEPSKINS

there is not one tanner in a hundred who does his own liming, the skins coming to the tanner in the pickle, and as he has so many different brands, pulled and limed by as many different pullers, it is impossible for him to get out a uniform run of stock. Some tanners who handle dry slats (the wool having been removed by sweating before reaching the tanner) work them in the following manner: Instead of placing them in the limes after soaking, and liming in the old way from eight to ten days, and then after working them over the beam putting them into a bran drench, they are placed in a pin wheel, a solution of sulphide of sodium is thrown in, the skins are thoroughly milled in this solution for one hour and then left until the next morning, when they are given a good washing in water to remove the hairy wool which has been reduced to a pulp by the action of the sulphide. The skins are then fleshed, washed in the drum in a solution of borax water to remove the sulphide, and, after being drained, are ready for the tanning. The cost of working the dried slats to the point where

they are ready for the tanning is about 12 cents a dozen, whereas by the old-fashioned method of working sheepskins after they have been pulled the cost is about 40 cents a dozen—a saving to the leather manufacturer of at least 25 cents a dozen in favor of the sulphide process. A saving equally as great is made by using the sulphide of sodium process on cabaretta, and the product is much finer and firmer. The cabaretta comes to the tanner in the hair. These are dried flint skins and after being soaked back to their natural condition are painted on the flesh side with a solution of sulphide of sodium, packed down in small piles and left until the next day, when they are unhaired. They next go into the drum, where a solution of sulphide of sodium of 3 to 5 degrees strength is given to them and they are milled until the short hairs disappear. A good washing in the wheel to thoroughly remove the sulphide is necessary and then the skins are ready for the processing or pickling.

THE ACTION OF THE SULPHIDE

is far different from that of lime. Lime swells the fiber first, then attacks the tissue of the skin, and then the hair sheaths. Sulphide of sodium destroys the hair without attacking the gelatinous substance of the skin, which it seems to solidify without shrinking. The preservative action of the sulphide is not unlike that of some acids. Tanners well know that, unless the tannage is applied to the raw material while the fibers are in a swollen condition, the tanning material will not be thoroughly absorbed and the finished product will not possess life and mellowness. The fibers of the skin after being in the sulphide are again swollen in the pickling process, the sulphuric acid and salt opening up the pores and putting the fiber in good condition to receive the chrome liquor. This processing is generally accomplished in the drum, and after the skins have been well milled they are horsed up for ten to fifteen hours.

BEAMHOUSE.

By working sheep and cabaretta skins through the beamhouse in this manner all hide substance is held intact, the leather finishes fine, mellow and firm, and has the appearance of goat. On calfskins, especially the dried flint stock for the chrome tannage, sulphide of sodium is used in different ways. Some tanners use it in the limes, some use it first and then place the stock in a white lime, and others use it in the same manner as for the cabaretta. When used in the lime liquor it is a very difficult matter to control its action, especially if the tanner is one who uses a hair washing and drying apparatus. He is desirous of saving the hair and depends more on the action of the lime itself than the sulphide. In this case after the limes are a little old the finished leather breaks up coarse and flabby on the bellies. This is due

to too much hide substance having been eaten away. By painting the sulphide on the flesh of the skins, removing the hair, and then liming for a short time, these mushy bellies are prevented.

IMPORTANCE OF LIGHT IN THE BEAMHOUSE.

An imperfectly lighted beamhouse must of necessity turn out skins which show cuts in the fleshing and which are not free from short hairs. It must also eventually result in great injury to the eyes of its beamsmen. In some beamhouses so imperfect is the light that it is necessary for beamsmen to carefully scrutinize a skin from all points, to make sure that the short hairs are all worked out. Now, this results in a strain, or a drain, on the proprietor's pocketbook as well as a drain on the beamsters' eyesight; for all this takes time.

The light in a beamhouse should come from windows directly in front of the beamsters, and the bottom of the windows should be no higher than the lowest point to which the beamsters reach. Some few years ago a tanner paid but little attention to the light in his beamhouse, since most of the leather was finished on the flesh side, and a few short hairs in the grain made very little difference.

SOAKING HIDES AND SKINS.

Not only is there a difference as to structure and texture of different classes of skins, but often skins of the same class vary greatly as to coarseness or fineness of fiber and grain, and for this reason the skins need to be carefully assorted before being placed in the soaks. The man for this work should have experience and judgment. A careful assorting of the skins here may make a considerable difference in the profit or loss on a given lot of skins.

DRY FINE SKINS HARDEST TO SOFTEN.

As a general thing, the dry, fine-pored skins are the hardest to soften and a longer time is necessary than for the coarse, open ones, yet it should be borne in mind that fine-pored skins of some species are much more easily injured than are fine-pored skins of other species, and the soaking must be carried out in accordance with the nature of each.

The calfskin is of the tender nature, easily injured, and, if the soaking be overdone, a loose, flabby skirt results when the leather is finished.

Sheepskins in the green state are easily soaked because of their open nature, but when in the dried flint state they are one of the most difficult skins to get back into their natural condition. The grease

being dried into the fiber makes these skins almost impervious to water and it is well to add some softening chemical to the water to be used in soaking this class of stock.

MILD CHEMICALS IN SOAKS A SAVING.

The chemical used for this purpose should be one that softens up the dried blood, grease, lymph and dirt, removes them, and allows the water to act naturally on the skin, not a chemical sufficiently strong to act harshly on the substance of the hide or skin. The use of a mild chemical in the soaks is saving annually to the tanners of this country many thousands of dollars; not only is it making available many skins of the dry flint variety that would otherwise go to the glue stock heap, but it is making a saving in substance of the hides or skins and improving the quality. It is doing this latter by shortening the soaking process and preventing a loss of coriin here, and by softening the epidermis in such a manner that after the skins have been placed in the limes the lime acts directly on the hair sheaths instead of attacking the coriin. All skins should be put through the soaks as rapidly as possible. A preliminary washing is often advisable, and so also it is well to change the water during the soaking process—the advisability of the washing or the change of water depending on the amount of filth in the hides or skins. It also depends upon whether or not the skins have been salted and, if so, the amount of salt in them.

ERRONEOUS IDEAS ABOUT SALT.

There is current among tanners an erroneous idea that salt in the water acts as a preservative of skins, and that there is less danger of the decomposition of a salted skin during the soaking process than of the decomposition of a fresh skin. Not only is this not true, but much flabby leather is the result of the salt not having been thoroughly washed out of the skins before putting them into the limes.

Goatskins are of tough fiber and grain. They require considerable soaking and are able to stand more abuse in the beamhouse than any other skins.

While it is important that the soaking be carefully carried out on all classes of stock—by this we mean that the skins should be brought back as nearly as possible to their natural condition on leaving the animal's back and that they be kept as free as possible from stains, yet the importance is relatively greater in soaking for some particular tannages and purposes than it is for others, when weight is a factor and the hemlock tannage is to be applied, a loss of hide substance is a more serious matter than when some of the other tannages are to be used; and if skins are to be used for fancy colors, the cleanliness of the soaks is relatively of more importance than when they are to be used for black stock.

SWEATING HIDES FOR SOLE LEATHER.

In American tanneries it takes a little longer to soak dry hides in winter than in summer, but when thoroughly softened it is wise to put them in a hide mill, if the sweating process is to follow. Some tanners put dry hides through limes after being soaked, but sweating has still many friends, and is largely carried on.

Hide mills are strong but simple machines. Two long arms connected with a driving wheel work in a tank containing some water. The driving wheel is set in motion and brings the arms in the hide mill backwards and forwards, so that when soaked hides are thrown in this hide mill they are vigorously pounded and thoroughly softened, preventing hard or unsoaked spots. The action of the hide mill is somewhat severe, but when the milling is not done, hides are likely to show damaged spots after being sweated.

TWO METHODS.

For the benefit of foreign tanners it should be stated that there are two methods of sweating hides in America. You can either build a sweat house or sweat hides by suspending them in vats, free from liquor. In building sweat houses the flooring is sunk below the surface of the ground of the tannery and the roof and sides are very thick, the space between the bricks being filled in with sawdust or spent tan. This is done to assure fairly even temperature in the sweat house. The sweats themselves are small rooms in which stringers of wood are so arranged that the hides can be suspended on sticks or hung on nails. These pits have almost air-tight doors and after the hides are suspended, the interior of the pit is dampened and the door closed. Should also state that most sweat pits have steampipe connection, so as to make the atmosphere warm.

Sweating is simply putrefaction of the roots of the hair. The process is more or less dangerous and has to be closely watched, as hides must be taken out as soon as the hair can be pushed off the grain with the edge of the thumb. If a thunder storm should arise when the sweating process is nearly completed, the electrical disturbance in the atmosphere has a curious influence on the action in sweats, and unless hides are unusually cared for during this period, they are likely to be damaged on the grain. Experienced men can quickly tell the difference between limed slaughter sole and dry-hide sweat leather on account of the sweated leather usually showing faint little pit marks on the grain, while limed leather is entirely free from this characteristic.

When vats are used for sweating, some tanners put a trough of water on the bottom of the vat and over it a steam pipe. Thoroughly soaked and softened hides are then suspended in the vat and the top carefully covered over. Sometimes the boards thus protecting the vat

are covered with spent tan and this is quite effective in excluding air and hastening the sweating process.

SHOULD BE EXAMINED NIGHT AND DAY.

After hides have hung in sweat pits for two or three days a strong odor of ammonia gas is generated; so much so that it is often necessary to leave the door of the pit open for a minute or two, so as to enable the workmen to enter to examine the hides. When examining, experienced men quickly recognize the hides that are ready for removal. If the examination is done late at night or at some time when it is not convenient to remove the hides, let them fall on the floor, leaving only those hides suspended which are not quite ripe for removal. Careful sweaters make a point of visiting the sweats, if necessary, at all times of the day and night, so as to be on hand to prevent the hides being damaged by hanging too long.

As each pack is finished, it is customary to throw the sweated hides into the hide mill again and the violent action there removes a large portion of the hair, leaving very little for the beamhands to do by hand. Some successful tanners do not approve of hides being milled that have been reduced by sweating. This is a matter for each tanner to decide for himself. No matter whether the hides are milled or not, it is customary to throw them in a lime vat after the sweating, and possibly some sulphide of sodium is added. They are left there for about half a day or a day and then withdrawn, fleshed and all hair removed. For acid tannage, these sweated hides are either thrown or suspended in a coloring vat; that is to say, a vat containing weak sour liquor, which contains little more than light coloring matter. The stock at once takes on a beautiful pinkish brown tinge and after thirty minutes' immersion, is hung in vitriol vats.

MAKING OF VITRIOL VATS.

The vitriol vats are easy to make. Vitriol (sulphuric acid) is fierce and savage material, so that it is always advisable for tanners to use it too weak rather than too strong until they know exactly how to manage it. In America an ordinary tanning vat contains about 900 gallons of water. Into this about a pail and a half of vitriol should be poured and then the mixture thoroughly stirred up. Dip your finger in it and you can judge by the taste whether it is too strong or not. Much depends also on the weight and thickness of the hides to be plumped in vitriol. Remember that the action of the vitriol is to plump or distend the fiber of the hide, so that it will be all the more ready to receive the tan liquor and thus encourage the growth of thick and substantial leather. Right here is an important danger point. If heavy hides are hung in acids of moderate strength the acid gently

distends the fiber, which is heavy and strong and not likely to become disrupted. Such stock is then in fine shape to be sent forward to the tan vats and when the leather is rolled and dried it will be thick and mellow without any tendency to crack.

On the other hand, if the acids are too strong, the hides suspended in them are so swelled and the fiber so strained that the tan liquor penetrates too quickly, thus burning the center, instead of the process being slow and gentle, which is necessary for the production of sound and satisfactory leather.

GREAT CARE NECESSARY.

It should be added that after the hides have hung for 24 hours in the newly made vitriol vat, that they should be taken out the following day and half pail of vitriol added to the vat so as to strengthen up. Before replacing the hides in acid, the latter should be well plunged up, as vitriol is heavier than water and has a tendency to sink to the bottom. Most tanners put about 100 sides in the pack and use two vitriol vats at a time, putting 50 sides in each vat. This prevents undue crowding and it is of great importance that each side be turned over once or twice during the time of suspension in the acids so that the same part will not rest too long upon one part of the stick. Some tanners give only 24 hours of acid and not 48 hours. These are little points, but it is the little things that count in this world. It is something of a trick to be able to get batch after batch of handsome, healthy-looking leather on the market without irregularity due to ignorance or carelessness.

This brings us to the all-important question of having a competent tannery chemist work hand in hand with tannery foremen for the purpose of seing that the tannery liquors are in the condition that they ought to be all the time, and not "off."

BEAM WORK FOR CASE AND BAG LEATHER.

To make case and bag leather it is necessary to start with good hides. That is, hides that are clear on the grain and free from butcher cuts. Place the hides in clean, fresh soaks and allow to remain twenty-four hours, then remove and split into sides. Care should be taken to get the backs straight.

After splitting, put them back into the soaks and allow them to remain until the next day. Then put in wash mill and wash for twenty minutes. The hides now are ready to flesh. After fleshing, put them into clean cold water over night and the next day they will be ready for the limes.

Liming will require six days, using 8 per cent of lime and 2 per

cent of sulphide of sodium. Be sure to dissolve the sulphide in a barrel or tub, with a hole two inches from the bottom. Place a wooden spigot in the hole.

After the sulphide is dissolved, it should stand at least twenty-four hours to allow the dirt to settle to the bottom. Dissolving the sulphide this way should prevent dark stains on the hides when going through the beamhouse. It is very essential to keep the grain free from all stains.

After the hides are unhaired they are washed in the wash mill for fifteen minutes, when they are ready for the vats.

BATING.

Bating should be done in a paddle wheel that is covered so as to retain the heat and get uniform results. The material used for bating must be clean in order not to stain the grains. The hides should be well bated so as to give a nice soft grain.

After bating the hides should be pickled in a paddle wheel with acid and salt as follows: For each 100 pounds of hides use 2 pounds of sulphuric acid at 66 degrees and 50 pounds of salt. Put in the salt and acid, then place the hides in the pickle and allow to run two hours. Watch the hides for the first hour. If they become swollen and transparent, more salt should be added. After running two hours they should be stopped and allowed to lie in the liquor over night. The next day take them from the pickle and pile down smooth to press for twenty-four hours. This amount of salt and acid is for the first pack. For the second and all following packs, 1½ pounds of acid and 15 pounds of salt for 100 pounds should be used. Run the pickle liquor until ten packs have been pickled, then clean out the pickle tub and start a fresh pickle same as the first one.

READY TO TAN.

After the hides have lain twenty-four hours in the pile they are ready to tan as follows: Take a clean paddle wheel and learn the capacity of the paddle tub in gallons. For each 100 gallons of water in the tub put in 50 pounds of salt. Put in the pickled hides and run an hour. Now take 12 pounds of concentrated one-bath chrome liquor to each 100 pounds of hides and dissolve in 4 gallons of hot water. Put half of the liquor in the paddle tub and run the paddle three hours, then put in the other half of the liquor and run paddle the rest of the day.

Close down for the night and the next day run until 4 o'clock, when the hides are taken out and piled down for twelve hours. They are then put into a wash mill with 1 pound of borax dissolved in 15 gallons of warm water. Run 45 minutes and then draw off the borax

water and take out the plugs. Turn on the water and wash with running water thirty minutes.

THE RE-TAN.

The hides are now ready for the re-tan. The paddle with the chrome liquor in it can be used for ten packs, when it should be cleaned out and new, fresh liquor started.

After the first pack is tanned in the chrome, use only 9 pounds of the concentrated one-bath extract and 10 pounds of salt for each 100 pounds of pickled hides. The retanning is started in a paddle wheel by making up a liquor containing 3 parts quebracho and 2 parts chestnut oak extract. Have the liquor 12 degrees barkometer and put the chrome tanned sides into it and run three hours, then allow to rest three hours. Now run two hours and take them out and pile down over night.

STRENGTHEN UP LIQUOR.

The next day strengthen up the liquor until it stands 18 degrees barkometer. Put in the leather and run same as on the first day in the vegetable tan liquor and take out at night and pile down until the next morning. On the third day strengthen up to 24 degrees, put in the leather and run same as the first day. Take out at night, pile down and allow to lie until the next day, when the hides will be ready to press and split.

Splits are retanned and worked into either Goodyear splits or flexibles. The grains are put into a mill and for each 25 sides dissolve 1 pound of borax in 25 gallons of warm water and run the leather in this borax solution fifteen minutes. Then drain off the water and wash the leather in three changes of water. Put 2 pounds of sulphuric acid into 25 gallons of water and run the leather in the acid bath fifteen minutes and drain off the water. Now wash with three or four changes of water, using at least 25 gallons at each change. Wash until the leather is free from acid.

SUMAC LIQUOR.

Make up a sumac liquor and for each 25 sides use one 3-gallon pail of sumac and put it in 10 gallons of water. Boil for fifteen minutes and cool down to 85 degrees. Put the liquor on the washed leather and run the mill three-quarters of an hour. Take out the leather and pile down with the same liquor in it and allow to lie twenty-four hours. It is then dipped in warm water to wash off the sumac. Now set out on the grain side and if it is to be brush or machine colored it is given a coat of cod oil on the grain and tacked out on frames to dry. If it is to be colored in a mill, it is ready for the color.

As soon as the leather is dipped in the tub after coloring in the mill, take it out and dip one side at a time in a tub of warm water and hang up to dry. Do not set it out of the color wheel, as you are liable to make the color spotted by working the dye out of the loose parts of the leather if set before it has had a chance to fix itself to the grain of the leather.

After the leather is hung up and is dry, take down and dip in clean warm water until thoroughly wet. Then set out on the grain, give a light coat of oil and tack on frames to dry. When dry, the leather is given a coat of paste made as follows: Take 3 pounds of white cornmeal and put it into 10 gallons of water and boil slowly three-quarters of an hour. Allow the paste to cool, then strain and give the leather a good coat. When it is struck in well, roll and hang up to dry. When dry it is ready to finish.

Grains that are not suitable for bag or strap leather can be worked into patent shoe tipping by splitting light and working through borax, acid and sumac just the same as for bag leather.

FAT LIQUOR.

After it has lain in the sumac twenty-four hours, make up a fat liquor as follows: For each 25 sides take 4 ounces of good soft soap and dissolve it in 15 gallons of water. Bring it to the boiling point. Then take 3 pints of good moellen degras and stir it briskly into the hot soap water. Cool to 100 degrees, put in the mill with the tipping and run the mill thirty minutes. Take out the leather and pile down over night. The next day set out and hang up to dry. When dry, dip them in warm water and tack out on frames to dry. When dry, buff off the grain on a buffing wheel and stake good and soft. The stock is then ready for the japan shop.

If the splits are for Goodyear they are trimmed off at the belly and shoulder and the butt is leveled on the splitting machine and given a good stiff re-tanning. After re-tanning they are given a light bleach of borax, acid and sumac, same as the grains, then set out good and hard and given a light coat of cod oil. Hang up so they will dry straight.

PASTE.

When dry, make up a paste as follows: Four ounces ivory soap, 1 pound white cornmeal, 2 quarts fish glue, boil thirty minutes in 3 gallons of water, then add water to make 4 gallons. Allow to cool and then give the splits a good coat of this paste. When almost dry, roll hard and dry, when they are ready for the market.

Care must be taken in making these different kinds of leather so that no dirty spots will get on it, as a spot of oil on a side of bag or strap leather will throw a number one side into a grade that will bring 2 cents per foot less.

LIME AND VITRIOL QUESTIONS.

Says a sole leather tanner: It will be understood by practical tanners that much discretion must be used in tanning leather, as hides differ in weight and quality.

American tanners use the vitriol process as follows: After the hides have been limed, or sweated, and unhaired, they are thrown into clear cold water and then pulled out and worked on the grain again, so as to remove fine hairs and get rid of as much lime as possible. They are then suspended on sticks, in a liquor drawn from an old handler or sour, containing practically no tannin, but merely coloring matter. In half an hour after suspension the hides have taken a pretty pinkish-brown color, and it is the aim of the skillful tanner to retain this color clear through to the rolling room. Some tanners color their young or green stock by throwing it into a vat in which there is a revolving paddle wheel, but we believe the suspension process is more used.

THE VITRIOL OR SULPHURIC ACID VATS

are made by putting about 900 gallons of water into a vat, and two vats are necessary. To each vat about one and one-half pails of vitriol, of about 66 degrees of strength, are added, and the water and acid well plunged up, so as to be thoroughly united. It should be remembered that vitriol is heavier than water and will sink to the bottom of the vat unless well plunged up. These vats should now have a slightly acid taste and it is better to have them too weak than too strong. It should have been mentioned at the outset that most hemlock sole leather tanners cut their hides from tail to head when they are taken out of the soaks, thus making two sides out of each hide for greater convenience in handling.

Hides from the coloring vats are usually suspended in the acid on wooden sticks in the morning, say, about nine or ten o'clock, and left there all day. Next day the sides are withdrawn for a short time, while a half-pail of acid is added to each of the two vats, which are well plunged up, and the sides suspended again in the vats.

HIDES DRAINED AND HUNG IN SOUR HEMLOCK BARK LIQUOR.

On the following morning, or say after the sides have been about forty-eight hours in the vitriol, they are lifted out and allowed to drain and then hung in sour hemlock bark liquor for six or eight days. These liquors are strengthened with more sour liquors each day and have the effect of continuing the nice, bright color of the sides, besides starting the tanning process. At the end of these six or eight days the sides are then placed in a first layaway hemlock bark, or sweet, liquor, from 13 to 16 degrees, and the tanning proceeds as usual. This

treatment refers to green-salted packer hides, which weighed 60 pounds and over before being put into the soaks. Lighter hides require less vitriol. Much depends on the judgment of the foreman in a tannery. Vitriol vats are usually tested by tasting. Weak vats will do far less harm to the young hides than strong vats. By cutting the thick parts it will be seen if the acid has struck through. Some tanners, after the 48-hour vitriol treatment, take the sides to an old layaway vat from which the tanned leather has been removed. The old liquor is sour, but not entirely worn out, and is good for young packs. It has been found better, however, to suspend the sides after leaving the vitriol vats in sour handler liquors for a week or so, as the liquors can be strengthened daily and the young stock is less liable to wrinkle than if thrown into a layaway vat when it is young.

This vitriol process, as mentioned, applies to packs containing about 100 to 120 sides, so that 50 or 60 sides will be hung in each coloring vat and each acid vat. The whole process is simple, but requires constant watching. Workmen should soon learn to know exactly how much acid to give to each pack and how to keep renewing for succeeding packs.

DRY HIDES, IN AMERICAN TANNERIES,

after being soaked, are hung in sweat pits. Those hides which may have hard spots on them are thrown into a hide mill so as to be thoroughly broken up before sweating, as hard spots in sweating would rot. After the sweating, which takes two or three days, the hides are very thin and run down and are usually thrown into a lime vat before being unhaired. For green-salted hides it takes about two days for soaking, two or three days for liming and one night in hot water, say 90 degrees. After this they are in good shape to be unhaired.

Some sole leather tanners use sulphide of sodium in unhairing.

American hemlock sole leather, on being tanned carefully without being plumped in too strong acid, maintains good, strong fiber throughout, and when thoroughly tanned, scrubbed so as to clean the grain as much as possible, are then smeared over with a mixture of cod oil and water and hung up to dry. When thoroughly dry—and by this we mean what is known as bone dry—the sides are dampened and placed in a dark and cool place and covered up so as to keep the air from them and left there for a day or two. At the end of this time the dampness has penetrated to the center of the leather so that the fiber is just soft and elastic enough to pack down and become solid under the heavy pressure of the pendulum rolling machine. Possibly one secret of American sole being so firm and solid is the way in which it is prepared for rolling. Some tanners roll their leather a second time.

CAUSE OF BRITTLE SOLE LEATHER.

Brittle sole leather is caused by undue or excessive plumping in the acids, followed by too rapid application of the tan liquors, which penetrate the hide too quickly. Young stock is tender and by not being forced the tanning process goes along easily and naturally, so that when the leather is thoroughly tanned and dried the fiber will be tough and durable and not short and brittle.

I would add that some tanners give only twenty-four hours in vitriol and only thirty-six hours in limes. Liming is done more quickly when the packs are kept reeled from pit to pit. The more lime used the mellower the leather will be.

A SULPHIDE OF SODIUM EXPERIMENT.

My first experiments with sulphide of sodium were made many years ago, says an old tanner. I wanted to improve my grain leather, as I was making fair stock, and needed a bright, soft grain that would not crack. To do this the limes must be strong, and I tried several methods until I struck the sulphide of sodium, which saved me.

The first successful limes I made I put about three bushels of lime to every 100 green-salted hides. To this lime I put one and one-half ounces of sulphide per hide, and the leather was fine. I have worked my limes up to about four bushels of lime to 100 hides, with three ounces of sulphide per hide, and find it better than the mixture first mentioned. The limes must be strong enough to kill the grease in the hide, and the sulphide holds up the hide, making good, plump leather. It also neutralizes the lime, making it wash out easily after treatment. The lime vats should be arranged in a line, so that the hides can be put into the first one, and then gradually reeled forward day by day to the sixth, making six days' liming. The first vat should not be replenished, as the lime that runs over from the second vat when the hides are reeled over will be sufficient. The second, third, fourth and fifth lime vats should be fully supplied with lime and sulphide as already mentioned every day before the pack is reeled over, and well plunged up, so as to stir up the sediment that settles on the bottom.

The sixth vat should be filled with clear water at about 85 degrees temperature. Leave the hides in for a day, same as in the limes, then pull out and unhair.

I have found this method makes the hides so that they will bate easily and take the tan liquor quickly, and yield a strong side of leather, with bright, smooth grain.

SOME BEAM HOUSE WARNINGS.

The following hints are by a practical tanner: In the first place, skins should be well soaked in clean water. It does not matter what kind of skins they are, they must be soaked until they are perfectly soft. It is best to mill them in a pin wheel with water for one or two hours. If fresh wool skins are in question, the milling must not be done, but the skins should be soaked and washed in such a way as to prevent injury to the wool. If the hair or wool is worth saving, the skins should be first painted on the flesh side with a depilatory and left for twenty-four hours. At the end of that time the hair or wool will come off easily, and the skins are then ready for the liming process.

I find it best to revolve the skins in a paddle wheel two or three hours, in fairly strong lime, so that the action of the lime will be uniform. Workmen are often careless and do not open out the skins properly when throwing them into the pit. In this event the stock will decompose in the folds.

LIMING.

It is impossible to state definitely just how long skins should be limed. Some require only six or eight days, while others will need thirty days' liming. They should be taken out of the pits, however, every day, and the limes should be renewed, and when the skins are returned, care should be taken to open them out. After the liming process is over the skins should be well washed in clear water, in a pin or paddle wheel. After washing the skins should be trimmed and the pieces saved for glue stock. If calfskins, cow or horse hides are used they should be trimmed before going into the limes. Some tanners find it best to flesh the skins before liming. Indeed, it is best to flesh large or heavy hides and skins before liming, because the lime will act quicker and the effect will be more uniform. If the fleshing is not done before liming, it should be done after trimming. The stock is now ready for puering or drenching.

SKINS INTENDED FOR GLOVE LEATHER

can be made softer by puering and drenching. In my experience a still drench is best, because gas will form under the skins, which will benefit the process. After the drench has thoroughly "worked" it should be well stirred. From six to eight hours is sufficient time to leave the skins in the drench, if it has "worked" properly.

The next thing is to work the skins on the grain side, which is called scudding. This is done to remove all dirt or fine hair. In my experience I have found it best to pickle the skins after they are puered or drenched. The pickle should be composed of salt and sulphuric acid. Sheepskins are usually treated in this way so that they can be pressed or wrung to extract the animal grease. If hair skins are

pickled it makes them much cleaner, and destroys the gas which was formed in the drench.

SKINS SHOULD BE PICKLED.

I have seen skins turn various dark colors when put into the tan liquor, because they had not been previously pickled. If the sulphuric acid of the pickling process does not agree with the method of tanning, the injury can be easily removed by running the skins in a solution of salt to which a little whiting has been added. In using the different vegetable tannages, larger quantities of liquor are required than are needed in the chrome or mineral process. In vegetable tannages the skins should be stirred in a paddle wheel or taken out and renewed every day until the tanning is completed. If the skins are tanned in any of the various acid, chrome or alum tannages, it is best to use as little liquor as possible. If large quantities of tan liquor are used the tanning material not absorbed by the skins is emptied into the sewer and wasted. There is great economy in restricting the amount of liquor for this reason.

GREAT CARE AND SKILL REQUIRED.

It has frequently been said that when skins arrive at this stage and are tanned, no particular skill is required to finish the manufacture of leather. This is a very great mistake. In every stage of staking, softening and coloring great skill and care is required. Wise tanners do not rush at conclusions, but experiment with different fat liquors, and seasonings for softening and finishing. Of course only small lots are used in the experiments. If the skins are not properly softened and seasoned, good results cannot be achieved in staking and stretching. It is impossible to get the best measurement if the softening process is not right. It must be admitted that quality, measurement and finish are the important considerations in making good leather.

SOAKING AND LIMING DRY HIDES FOR PATENT LEATHER.

This formula is for 230 to 240 whole hides per soak: Soak twenty-four hours, then take them out and give a good milling with some water. Put them back in the same water over night, and next morning take them out and mill again with a liberal supply of water. Pile them hair side up and next day split them down the back and put them in the limes.

FOR A NEW LIME.

Take a barrel of lime and put it in the pit, with sufficient water to slake. Lime the hides from six to seven days; six days is enough; over seven days is too long.

Mix a tub of lime as follows: Take two barrels of lime, six pounds of arsenic to the tub, slake together, then take five horse pails each day for six days.

Use sulphide of sodium in the last three limes. Use twelve limes if you can. Mix the sulphide of sodium as follows:

To a barrel of water add about one and a half pails of sulphide. Cook well until dissolved, then take three gallons from the barrel and put it in pit No. 4, three gallons in pit No. 5, three gallons in pit No. 6, and in pit No. 7, if you lime, seven days. Soaking is the principal thing, and should you run across some hides that are not soaked properly, they should be left in a pile, hair side up, a night longer, and milled fifteen minutes next morning. If you put hides through the limes not properly soaked you will find they will gouge when splitting. They are sure to suck in, and very often the blame is laid to the splitter, when he was not at fault. This is a very important part of the dry hide process.

PITS SHOULD BE CLEAN.

Take great care that your pits are kept clean. Start on a Monday and clean pit No. 1; Tuesday, pit No. 2; Wednesday, pit No. 3; Thursday, pit No. 4; Friday, pit No. 5; Saturday, pit No. 6, and so on until the eleven or twelve pits are all cleaned. Then let them stand one week before you clean them again. Use well or river water in the soaks. It is well to try a small lot first and leave the arsenic out. The best results are secured by the use of sulphide of sodium. When the sides come from the limes they are unhaired and fleshed, and fine-haired by hand. This is where the beamster must watch the fine hairs. Hides that go into patent leather must be free from fine hairs. Their presence gives lots of trouble. Dry hides are much harder to unhair than green salted hides. Should they come to the enameling room with hair on, the heating process burns the points of hair. By carefully fine-hairing, this can be avoided. The hides or sides should be put on horses two days before splitting out of the limes, so that they are well drained off. Use a corrugated roll for splitting out of limes.

PLUMPING HIDE FIBER.

The necessity of plumping hide fiber by the means of sour liquors before giving the green stock strong tannic acid, is well understood by the average bark tanner, but the tanner of chrome leather is at a disadvantage when he comes to tan the green splits in bark, not understanding the action of sweet and sour liquors on the start.

The hides having been limed for chrome leather give a split in which the fiber has not been swollen, like hides that have been limed for a vegetable tannage.

CHEMICAL REACTION.

Bark or extract tanners need a chemical reaction in their art. Sometimes they get more of it than they need, but this is through their ignorance as to how and why these changes take place.

A chemical reaction of their liquors is needed at one stage only, and that is during the plumping of the green stock in the liquors. Here the tannic acid does not play so important a part. It is the lactic and acetic acid, together with the other precipitations, that cause the plumpness. On this point tanners have been wavering back and forth for a long time. How far they should go to obtain the best results is the question. They know that in using sour plumping liquors they obtain various results. Sometimes their leather shows a good gain in weight and plumpness, and again it shows a loss in weight and of loose texture. This has for a long time been the experience of tanners, and it will be until they are able to determine with exactitude the extent to which fermentation has gone. A liquor used for plumping the green stock today may be in acids at the proper stage. Tomorrow it may have passed that stage and be only fit to run into the sewer.

LACTIC AND ACETIC ACID USED.

These acids so necessary to the tanner develop from the sugary matters contained in the bark liquors by fermentation. In a tannery where extracts are used instead of the bark itself, the natural acid is not of a sufficient quantity to plump the green stock, and it becomes necessary to add sufficient lactic and acetic acid to plump and swell the fiber.

TANNING SPLITS FROM GREEN HIDE.

In tanning the splits from green hides, if the stock has been processed in salt and vitriol before splitting, it is necessary to add sufficient salt to the extract liquor to keep the acid in check.

The splits should be well softened in the drum containing a warm salt water solution, and then tacked on sticks and suspended in the plumping liquors. After the stock is well plumped it should be sifted forward into stronger tanning liquors containing no salt whatever. By suspending the stock, plumper bellies and flanks are obtained than by loosely throwing the splits in vats and continually hauling them and setting bark.

The stock can be taken after it is well struck through, placed in the drum and well filled by drumming it in strong extracts.

By trying to tan green splits in a drum containing sweet liquors, the result is hard, tinny leather of very poor weight.

PLUMP AND SILKY LEATHER.

Even in the combination tannage where salt, alum and gambier are used as the tannage, plumper and far more silky feeling leather

is produced by suspending the stock in a liquor that has become mellow by a little age than can be produced either by paddle tanning or by the use of a drum. Here in this tannage the acids cannot be relied on as a lime killer. The lime must be entirely removed where gambier is to be employed, or the stock will take on a reddish hue on the grain. Green stock to receive the combination tannage should be paddled for a short time in a weak solution of boracic acid and water in which all traces of lime disappear.

LIMING AND DELIMING SKINS.

In the first process of preparing hides and skins for tanning, particular attention and care should be given the different nature of the raw stock. Different treatment is of course required, but all should be sorted and classified before placing in the soaks, according to their weight.

THE FOUNDATION FOR GOOD LEATHER

is made in the beam house, and to successfully manufacture an even product the tanner must be a good judge of raw material and be able to vary the liming and deliming process in accordance with the conditions and needs of each lot of skins.

Skins vary in construction. Some are compact and fine, others are coarse and open, and the coarse, open skin needs very different treatment from the fine, compact one.

SOAKING.

The water used in soaking plays an important part, and also does the manner in which the skins are softened. After the skins have been fairly soaked a good milling in the fulling mill is necessary to break up the glaze on the flesh side and soften the fiber. The pulling mill, or breaking stocks as it is sometimes called, gives better results than can be obtained by hand or other ways. Stock not properly softened before going into the limes will account for many defects in the finished leather. It is just as necessary to have a skin soft and clean on going into the limes as it is for a tanning liquor.

LIMING.

The liming is materially assisted when the skins are in nice, soft, stretchy condition when going in, and the lime is able to penetrate far easier and quicker; if the skins are hard they are not limed to the best advantage or receive the full benefit of the lime, being flat and tinny, and often go to pieces in the bating.

The object of milling the skins is to bring them back to their natural condition, free from all dirt, dried blood, etc.

FIRST LIME.

The first lime should be a weak old lime containing red arsenic or sulphide of sodium to prevent undue swelling of the fiber and roughness of the grain. Lastly, the skins should go into a fresh white lime. From this lime the stock should be placed in warm soft water, 80° to 90° F., and left for a number of hours before starting in to unhair on the machine. The warm water softens the grain, relaxes the hair sheaths, and there is less danger of roughening the grain.

After fleshing the skins are washed in the drum to free from the excess of lime. Care must be taken that this washing is not carried too far; if it is thin, tinny leather results.

BATING.

In bating the skins there is something more called for than simply the removal of the lime. The idea is to produce fineness and give to the grain a soft, mellow feeling to the whole skin. To produce this a bacterial bate must be used.

PUERING.

On the puering much depends, and insufficient puering results in harsh, high grain, which shows up badly when the skins are finished. The soft, silky feeling so noticeable in high class glazed kid leather is obtained by using as a bate dog puer in an unfermented state.

After puering the skins are stoned out of warm water to free them of scud, short hairs, etc., when they are ready for the bran drench.

Lactic acid is often used instead of the bran drench, many tanners believing since lactic acid is developed by the souring of the bran and that acid does the work, it is cheaper and safer to use the manufactured article. While it is true that lactic acid is developed in the bran drench, the action of each is different. One is purely chemical, the other purely bacterial in its action. Temperature and atmospheric conditions enter largely into the consideration of one, while the other is entirely independent of atmospheric conditions and comparatively independent of atmospheric temperature, its only effect being to hasten or retard its action in a very slight degree. A temperature below 60° F. in a dung bate will practically stop bacterial action, while above 80° F. will hasten it to a dangerous degree.

The action of lactic acid on lime is to change the active or caustic properties of the lime into lactate of lime, a substance nearly or quite neutral in its reaction, neither alkaline nor acid, readily soluble in water and harmless in its effect.

LACTIC ACID FOR DELIMING.

For all classes of stock where weight, solidity and strength are the factors in the leather, lactic acid is no doubt one of the best chemical

deliming agents known. Its affinity for lime is so strong that it will never attack hide substance if properly used until all lime is neutralized, and this can be said of no bate depending on bacterial action for its efficiency.

Some consider the use of bran of doubtful utility, either alone or in connection with the lactic acid. This is not the experience of many sheepskin and goatskin tanners. It is the fine break and softness in the grain that these tanners are after which the lactic acid alone does not give.

For a bath after the skins have been drenched lactic acid kills all remaining lime, stops putrefaction and brings the stock in good condition for tanning.

MOLASSES BATE.

To bate hides that have been in lime and sulphide of sodium, a molasses bate is best.

Fill a paddle wheel with enough water to cover 50 sides and add to it eight pails of molasses which have been previously soured. The souring is done by putting seven gallons of molasses into a barrel of water, adding a gallon of milk to help the souring and keep this mixture at 90 degrees Fahrenheit, stirring occasionally until sour. More than one barrel is required, so that more barrels can be souring while the first is being used.

When the bate becomes weakened by the lime which works out of the hides, add more molasses, say six pails to 100 hides or 200 hides. If the paddle holds 50 sides put in 1½ pails of molasses after taking out each load and keep it about 80 degrees of heat. Do not change the bate, but keep adding to the old liquor.

Judgment must be used as to when the hides are bated enough. Thirty minutes should be sufficient to prevent the hides being bated too low.

The bating being over, withdraw the hides and rinse in cold water in another paddle wheel for a few minutes and after this washing put on sticks for the tannery liquors. These bated hides will contain considerable lime, but the first few hours in the liquor will take it all out.

After the liquor has been run through the yard from the head handlers to the tail handlers or rockers, the liquor in the tail handlers will be very weak, containing less than one per cent of tannic acid, and quite a little lactic and acetic acids which will soon take the lime out of the sides and plump them.

A little lactic acid added to the liquor will help considerably, say three quarts or a gallon to the bate.

FERMENTATION IN TAN LIQUORS.

Today we hear more and more about fermentation and bacteria in tan liquors, and the effect of the same in regard to loss of tannic acid.

Perhaps as a tanning material sumac liquors are more liable to fermentation than any other. It may be that the sulphuric acid used in connection with the sumac in tanning the skins has something to do with the fermentation, since tannic acid is rapidly converted into gallic acid by boiling in dilute sulphuric acid.

SKIM OUT THE SPENT SUMAC.

Men who run tan tubs in the morocco shops are obliged to use the utmost care during the summer months to keep their liquors from souring. When fermentation does take place they are obliged to throw the liquor away and start a new liquor. This doubles the cost of tanning the skins, since it costs as much to start the liquors as it does to tan the skins. Tanners who fully realize the liability of liquors to ferment are very particular about skimming out the spent sumac from their tubs, taking care that they skim it all out.

One large morocco manufacturer, who tans thousands of dozens annually, thought that if he took the spent sumac and leached it by using heat he might save a big thing. Hence, instead of leaching the old way, he placed the spent sumac in a large leach and boiled it by the use of steam. It was but a short time before his tanners complained that the skins were coming out flat and tinny, and that the liquors were commencing to sour. The scheme was soon given up.

CARE IN UTILIZING SPENT SUMAC.

Another tanner of sheepskins, who tanned in bark, thought he could profitably utilize the spent sumac from the morocco factory. Every morning he had the sumac hauled from the morocco shop to his tannery and dumped into his vat. After putting sufficient sumac in the vat he gave it a good boiling with steam, and when the liquor was cool it was pumped into the vats. Instead of pumping the liquor into vats by itself, where he could test the result, he used the liquor to fill the vats where he had laid away the skins. The result was a lot of flat, spongy skins and fermented liquors. This tanner learned something, but not without paying for it.

There must surely be a loss of tannic acid from liquors as long as they are exposed to the air, although they will not ferment if changed with sufficient frequency.

There has been considerable said in regard to leather becoming impoverished and going back in the layaways. If a pack of leather has enough to feed on in the layaways until it is tanned, and is excluded from the air, there is no knowing how long it may keep.

IMPORTANCE OF PERSISTENT TESTING OF BARK LIQUORS.

A practical tanner writes: Some time ago I noticed an interesting article in Hide and Leather on the wisdom and necessity of methodically and regularly testing bark liquors in tanneries.

It was stated that this is done by the United States Leather Company in their tanneries throughout the country, with excellent results. The company has several laboratories or testing stations, with quite a staff of experienced chemists, assisted by young men whose business it is to keep investigating the spent tan from the various sole leather tanneries and also to keep rigid watch over the sweet and sour bark liquors. The foreman whose bark shows poor results soon hears from headquarters.

It is unfortunate that some sole and harness leather tanners consider their business above and beyond the necessity of the chemist's aid and protection. Several big tanneries have their own laboratories, but there are many places throughout the country whose owners appear to have little use for chemists until some error becomes too glaring to be neglected.

Sole leather tanners cannot do better than follow the example of big tanners in regard to continued testing of bark liquors. The big corporations have a regular system of keeping a book account with each leach made and each car of bark ground up, and with the various sweet and sour liquors used daily. They do not spend $3 once or twice a year on the chemist, but have a whole crowd of them carefully watching and seeing that the yards do not go wrong. It is very evident that this cautiousness pays, or it would be dropped.

BARK LIQUORS SHOULD BE TESTED BY CHEMIST.

I am of the opinion that every tanner who uses bark liquors should have them continually tested and watched by a competent chemist. It is pathetic to see a tanner throw up his hands in dismay when urged to spend a few dollars weekly for chemist's services, and yet be liable to lose thousands of dollars when least expected on account of his leather being "off" in quality. Under the care of the right kind of chemist, no tanner will produce "off" leather unless experiments are undertaken and unknown paths are trodden or efforts made to find short cuts to wealth. All healthy bark liquors should show a certain standard of sweetness or acidity. It is the chemist's business by proper tests to at once detect errors in the liquors and to at once discover and apply a remedy. When tanners are left to themselves evils are often neglected until a lot of leather is spoild.

TANNER AND CHEMIST SHOULD CO-OPERATE.

There is little use shutting the door after the horse is stolen. From time to time I have come across such good results from the co-opera-

tion of chemist and tanner that I would urge those tanners who profess to be indifferent to chemists to reconsider their attitude. Those who doubt the value of these suggestions should employ some good, reliable leather trade chemist to look after their place for say three months, and to report at frequent intervals. It is pretty safe to assert that as soon as the chemist got his hand in he would make his services well worth the cost. There is no excuse for poor or unsatisfactory leather being turned out today in the light of what is known as to the best means of not only making good leather, but avoiding evil methods.

Sole Leather Tanning.

HINTS FOR SOLE LEATHER TANNERS.

New wrinkles keep cropping out from time to time. The man who has no time to keep posted is the one who keeps complaining about dull trade and lack of profit, writes a veteran tanner. I have heard surprise expressed at the beautiful appearance of some tannages of sole leather. The color was just right and the leather looked so desirable that it was not difficult to sell at full prices. How was it done? This color effect may be new to old timers in tanneries, and possibly some of the dye-stuff houses themselves are not aware that their products can be used helpfully on muddy grain of sole leather. Some extract manufacturers are often bothered by complaints from customers, who say that the extract, while doing all that was claimed for it, produces a muddy color. The aniline dye scheme should be welcome news to them.

BLOTCHY LEATHER IS NO LONGER PERMITTED

in first-class, up-to-date sole leather tanneries. There was a time when the blotch went with the leather, same as the tail with the hide. Nowadays the man who knows his business keeps a little naphthaline on hand and applies it to lime stains which appear in green stock in the tannery. Another scheme for removing blotches is to touch the afflicted spots with weak sweet extract liquor when the sides are in the handlers. These little hints may possibly be useful to those who are sometimes liable to forget that it is often the simplest remedies that produce the best cures.

USE OF DYE STUFFS.

Talking about dye stuffs, I would suggest that the painting of the grain be done between the first and second rollings. Sole leather, bone dry from the loft, has a somewhat porous grain, but after a good rolling the leather is solidified and will then take the dye.

Some new things have been offered to tanners to be used in the beamhouse instead of lime. They add weight, and in this direction have advantages over our old friends, epsom salts or sugar. Sugar has a tendency to turn acid, and epsom salts has the bad taste to spue on

the grain. The new stuff for unhairing is said to enable tanners to thoroughly work the hair from the grain, thus leaving it in specially favorable condition for taking tannin. When lime is used the hair seems to come out all right, but the roots are left in the bulb below the grain and resist to some extent the entrance and retention of tannin.

THE EMPLOYMENT OF EXTRACTS

in quick tanning sole leather is another pretty nut for tanners to crack. The bright, up-to-date tanners are doing all in their power to get posted on the way to drum-tan sole leather and much is going on in tanneries today that is not published. It is fortunate that many sole leather tanners are in the country, where disappointing results of experiments and other business crosses and burdens may be buried out of sight. And yet the tanners who never made a mistake never did anything. It takes nerve and some ready cash to test new ideas and new materials, but the man who balks is liable to wake up some morning and find himself sitting down unexpectedly. It is part and parcel of the business policy of leading tanners to either travel and visit other tanneries themselves or send their foremen. The big sole leather corporation has its eyes and ears open all the time, and little goes on in the independent plants that is not known at the headquarters of the big corporation.

TANNERS MUST BE PROGRESSIVE.

Some tanners have a wonderful faculty for either mind-reading or knowing how and when to buy valuable and necessary information. One thing certain—no tanner of today can hope for permanent success if he sticks his head in the sand like the ostrich and fancies because he can see nothing that there is nothing doing. One of the best sources of information is the cute and observant traveling salesman, who goes from tannery to tannery and has a way of figuring that he can reciprocate for orders by putting his customers on to the latest ideas and wrinkles. This is a somewhat delicate business and some men who travel selling materials to tanners and curriers are no longer permitted to go over tanneries on account of their too easy tongue. Maybe the true reason for their exclusion is not openly stated, but a man must be a very tactful diplomat to know what to tell and what not to tell when traveling among competing tanneries.

Manufacturers learn to judge by inference. When a traveling salesman tells a tanner all he knows that is going on in another plant it is pretty safe to figure that the tanner who is being addressed will be chary about letting the visitor go through his plant. We are all fond of news and gossip, but it is well to pick the right time and place for what we say and to size up those whom we are gossiping with.

PROGRESS IN TANNING SOLE LEATHER.

For many years observant and enterprising tanners of heavy hides have experimented from time to time with drums for hastening the tanning process, writes a practical tanner. They believed that success could be achieved, but found the path long, expensive and weary. Several corporations were organized for quick tanning of heavy leather, but all failed, and much money was lost. Something was learned, however, from each effort, and there were men connected with the failures who were smart enough to remember things and store them away in their minds for possible use in the future. The end of the long lane has now been turned, and new and improved processes are now being used in the production of heavy leathers.

FREE USE OF EXTRACTS.

The new methods involve the free use of extracts. Things are being done on heavy leathers today with extract which would have been considered revolutionary years ago. It must not be taken for granted, however, that successful drum tannage of heavy leathers is simple or easy. Mistakes have been made behind closed doors, but progress is being achieved all the time by those willing to pay the price of success.

USE MODERN METHODS.

Some time ago I was in a sole leather tannery where the usual old-fashioned methods were used. And they did seem old-fashioned to me when I recalled what the modern and up-to-date heavy leather tanners were accomplishing. The tanner was making good leather and seemed satisfied, but I ventured to remind him that it was just possible that he was unconsciously in a dangerous position. When I suggested that he visit sole leather tanneries employing the most progressive processes, he appeared offended and replied that he had conducted a prosperous business for many years and considered his leather equal to any on the market. I then explained that others were making just as good leather, but tanning in much less time, and getting happy results in weight and other considerations. I saw my friend again some weeks later, and he told me he had taken my advice and visited other tanneries and that his eyes had been opened to the immediate necessity of establishing radical changes.

RAPID TANNING WITHOUT DRUM MOTION.

While drums are being rapidly introduced into heavy leather tanneries, rapid tanning is being conducted in some places without drum motion. It is not surprising that the seal of secrecy is placed on the lips of those who are permitted to witness the latest successes in heavy leather plants. In some sole and belt leather tanneries it is figured that the soaking and beamhouse work in general will consume about ten days, including the coloring. The hides or sides are then

rocked in sour liquors, continually strengthened for ten days, and a further ten days' hanging is given in strong sours. Then follow one or two layaways and the leather is put into a mill with strong extract liquor and the tanning rapidly completed. This is a mere outline, as quick tannage processes are not all the same. One well-known oak leather tanner formerly gave a strong last layaway for about sixty days, but now finds this time can be saved by putting the leather in a drum for a day or so and finishing in the lofts. I heard of a case recently where a tanner who sold some drum-tanned leather with a certain amount of trepidation to an exacting customer was pleasantly surprised by a letter commending the leather and asking what had been done to improve its quality. It need hardly be added that this tanner is now putting in drums as quickly as possible while feeling his way cautiously so as not to make mistakes.

A WORD OF WARNING.

The popularity and success of drum tannage in heavy leather tanneries will encourage or even excite tanners who are still sticking to old processes. Men who have been connected with successful drum tannages may be tempted to imagine that they are thoroughly posted and qualified, therefore, to introduce the new system into other tanneries, at liberal compensation. Every new development of manufacture is followed by a crop of men more or less well informed, but in many cases a little knowledge has proved a dangerous thing. It is well known that several men have undoubtedly mastered the secret of successful drum tannage of heavy leathers, and their services are doubtless well worth engaging at a comparatively high price. Wise tanners, however, will be extremely careful in thoroughly investigating the record and performances of all who offer to teach them new methods of manufacture, and all honest men who can faithfully do all they promise will welcome strict investigation to the end that regrets may not follow experiments.

QUICK TANNED SOLE LEATHER.

One of the most successful producers of quick tanned oak slaughter sole leather told me that it cost him only 4 cents a pound to tan and finish this leather. Four cents is a very low price for the production of good leather. If the successful quick-tannage men can do all they claim the future is theirs.

OLD-FASHIONED TANNERS DOUBT CHEAPNESS.

Tanners who still follow the old-fashioned layaway methods of tanning sole leather sometimes claim that it is not any cheaper to use

quick-tanning processes, on account of the extra amount of labor and attention required. There may be something in this, but the tanner who visits one of the plants where leather is made in short time solely by the use of extracts might be inclined to think that a strike was in progress, from the few men seen about.

It is surely something for a sole leather tanner to be able to dispense with his bark piles, leech house, mills, tan conveyor and tan furnace. The tanning may be done in drums or by supension. Drum tannage might be thought to breed wrinkles in leather, but packs of sides that have come through this process are as smooth as a billiard ball and filled out handsomely from edge to edge.

SUSPENSION TANNAGE

is a pretty sight. The sides are suspended in liquors, which are kept constantly gently stirred by mechanical means. The sides remain untouched by hand until nearly ready for lofting, when they are immersed in a specially strong liquor, so as to be well finished and carry as much legitimate weight as possible.

The cost of making sole leather is goverened largely by the price of bark, labor, freight charges on raw and finished materials, rent, etc. One tanner may contract to tan hides into union sole at 5 cents per pound, while others may demand 6 or 7 cents, according to their business acumen.

The quick tanners talk 4 cents a pound and probably are coming pretty near to the truth. It is difficult, however, for them to get cost of production down to the lowest point possible unless they can work in a plant well adapted to their purpose.

SEVERE COMPETITION LIKELY.

For this reason, old-fashioned sole leather tanneries are liable in future to run against severe competition from new plants especially constructed for quick tanning. It is no small saving for a tanner to be able to let his packs remain untouched by hand during the tanning process, instead of raising them three or four times, as in the old-fashioned way. Quick tanners are using chain conveyors in their beam houses, so that hides can be reeled from lime to lime in comparatively few minutes, and be easily straightened out as they fall forward, by two active men.

It may be that the quick tanners bleach their leather in order to give customers the kind of color which is considered fashionable. This is a small matter, as bleaching materials are cheap and their operation does not much affect the weight of the finished leather.

QUICK TANNING BY EXPERTS.

Quick tanners having solved the problem of making first-class leather in a short time by the use of extracts alone, have possibilities

of all kinds before them. They are liable to be induced to start plants near hide centers, and thus reduce the heavy cost of moving hides to distant tanneries. Extract tanneries could be easily erected alongside of the big packing houses, and the serious cost of shipping hides to tanneries and then moving the leather long distances to shoe and leather factories would be considerably reduced. Nowadays there are immense shoe factories which might be willing to contract for steady supplies of extract tanned packer hides, as the leather would be regular in trim and texture as could be desired.

It might be figured that it would pay to build extract tanneries alongside extract works, so that extract manufacturers, instead of of putting their products into barrels to be freighted to market, could run it directly from the vacuum pans to the tannery, to be distributed as desired.

A DIFFICULT TASK.

In talking about quick-tanned sole leather I am aware I am handling a dangerous subject. There are men all over the country who have burnt their fingers in trying to learn the great secret of making marketable sole leather at reasonable cost in less time than usual. There are men who have yet to burn their fingers, and will probably do so in trying to float schemes for quick tanning of sole leather, which lack records of practical and sustained success in tanneries. It is not easy to make thoroughly successful and profitable leather with extract alone, and those who have gained this valuable knowledge are to be envied.

In many tanneries throughout the country sole leather is being made in less time than formerly, and no doubt it will not be long before extract tannage will be as well and generally understood as chrome processes.

AVOID SHORT CUTS.

Meanwhile those who are seeking for light on this subject of tanning leather with extract in a short time should be warned to avoid apparent short cuts to success. There are tricks in all trades, but after all it is the honest, straightforward man who wins out, although crafty competitors may seem at first to distance him. Old-fashioned methods in making sole leather were good enough in their day, but are gradually being displaced by newer and quicker schemes. Right here it should be remembered that revolutions are not customary in any such heavy and conservative business as that of making sole leather, and no method of quick tanning should be accepted which cannot produce indisputable proof of honesty and worth.

LEARN ABOUT NEW PROCESSES.

The tanners who have made a success of using extract alone have had to struggle hard to learn how. Meanwhile tanners who are

complaining about lack of profit should bestir themselves and learn something about the new possibilities that have arisen in sole leather tanning.

DRUM TANNAGE OF HEAVY HIDES.

A tannery superintendent writes: My experience in drum sole leather tanning has thoroughly proven to me that just as good and far cheaper leather can be made in drums than by the longer methods used in the past.

SOAK THE HIDES.

Soak the hides three days if the temperature of water will permit. You cannot soak a hide too much, unless you go to extremes and spoil the hide. Use three limes. The first lime should be a weak solution, used more to start the dirt slipping from the hide than for any other purpose. Then make two strong limes, using about six bushels of lime to one hundred hides. Leave the hides from four to six hours in the weak solution, then reel in strong lime over night.

REELING.

The following day reel from one strong lime to the other; three times in the forenoon and three times in the afternoon. The last reel should be about 5 p. m. Leave in lime over night and the following morning reel in hot water pool, temperature 90 degrees Fahrenheit. Leave in this water for twenty-four hours, then reel in second hot water pool, temperature 100 degrees. Let hides remain another twenty-four hours in this water, then reel in third hot water pool, 110 degrees, and let remain until the following morning. Before putting hides in this last pool, put 10 pounds of sulphide of sodium to 50 hides, and if pack is larger use on same basis. The sodium gives a smooth grain and makes the hides unhair nicely, either by machine or hand.

After unhairing, put the hides in a wheel with clean water running through cludgeon into wheel while the wheel is in motion. Run for five minutes, then take from wheel and grain. By using this method, I find the dirt and lime works out with great ease. After graining, hang over night in cold water. Put one pound borax to 50 hides.

ROCKERS.

The hides are now ready for rockers. I have used several kinds of rockers, but prefer the Dubois system to any other, as the hides not only rock but they have a motion lengthwise also. The hides take the tanning very rapidly, as can be seen by watching the liquors closely. The hides tan out in the thick parts of the hide, which is

necessary. If the hides are not tanned so no raw streaks appear when put in drum, the strong extract will not take hold and fill the fibres as it should.

LIQUORS.

Hang in tail rocker liquor. If made from bark, 6 degrees barkometer; if extract liquors, 4 to 5 degrees is sufficiently strong to start with, but should be fed up to 7 degrees in twelve hours and kept there, as the extract liquor penetrates faster than bark, and if liquors are not kept up, the hides will get red, the flanks will darken and spots show up on hides. When finished the color will resemble a chocolate brown.

FEED STEADILY.

Put liquors on head 25 degrees barkometer and continue to feed steadily night and day, also keep rockers going as much as possible for twenty-three days, then take off and lay away for ten days in 25-degree extract liquor, wood or bark. Put 250 pounds quebracho extract, 50 pounds sugar, 12 pounds wheat bran, 1 gallon acetic acid. After 10 days, turn into 30 degrees extract liquor. Put 300 pounds quebracho extract, 70 pounds sugar, 15 pounds bran and 1½ gallons acetic acid. Leave in this layer for 15 days, then draw and crop for drums.

FOLD BACKS GRAIN INSIDE.

The backs should be folded grain inside and pinned together, head and tail, top and bottom, also pin half way between the fold and butt, also top and bottom. I have used a wooden pin, but it makes too large a hole, so I find a brass pin made specially for the purpose much better and safer, as it will not come loose so easily. If the side comes loose it will grain up to some extent and is hard to roll down. The size doesn't cut much figure if properly constructed inside. Say drum is seven feet high, it requires sixty pins of wood, ends turned round so as not to scratch the leather, two and one-half inches diameter turned tapering. Bore holes from outside drum and drive pins through until they show six inches clear on the inside. The pins must be put in rows of four pins and it is a good plan not to have pins in line around the drum. Put four planks inside the drum clear across the drum. Let boards be flush with face of pins. They will keep the liquor in motion and well mixed, also assist the pins in picking up the leather.

DRUM WORK.

Fill drum two-thirds full of extract liquor, 100 degrees barkometer; put in 100 pounds quebracho extract. Put in leather. Have liquor cool as possible, start drum and let it run continuously until temperature rises to 100 degrees Fahrenheit. It will take about thirty-

six to forty-eight hours to get heat up to 100. After forty-eight hours running pour out one-half the liquor and fill again with extract 105 degrees, and add another 100 pounds quebracho extract. Start drum and run regularly as possible until ninety-six hours have been made. The heat can go to 105 degrees and should be run until the 105 mark is reached, but no trouble will be found in getting up heat. I have had to take planks in the summer, as I had considerable difficulty in keeping heat down without stopping and opening door to cool.

BLEACHING.

When time is up take leather from drum and put in a vat made with quebracho extract liquor 105 degrees Fahrenheit and 130 barkometer. Leave leather in this liquor over night. Then draw and rinse in clear water. Then take stock and scour flesh and grain very lightly before going to bleaching tanks. The size of bleaching boxes doesn't make any material difference, as I use three and three-quarter pounds soda ash to the hundred gallons of water and use four pounds sulphuric acid to 100 gallons, but I use two boxes for acid where I only use one for the soda. To be economical it is a good plan to have boxes to hold 700 to 750 gallons. If larger it takes longer to exhaust the solution, but the first stock going through will be too white as a usual thing. Have the temperature 123 to 125 degrees Fahrenheit, soda box and acid the same temperature. It is necessary to have a man that is reliable in charge of the bleachers. If heat is over 125 degrees it will cause some trouble with the stock breaking when finished.

WATER BOX.

In connection with the acid boxes have a long box, which will hold fifty backs, filled with clean water. Fill this box before taking any stock out, then as you remove the stock from the box fill again from acid boxes. Continue this practice until 12 o'clock, run this water off and fill again; then bleach. I put through 1,000 sides. Then make a new solution. Keep up soda and acid by adding four pounds each after every fifty backs; plunge well every time box is emptied. After taking from box following bleaching put in clear water for two hours and then take out and hang up to drain for oiling.

My reason for hanging instead of cosing down preparatory for oiling is that when extract leather is cosed down I find the excessive weight will press extract to the edges and cause the leather when drying to be dark on the edges and have a tendency to crack. This would attract the attention of any competent buyer or tanner and naturally would cause unfavorable comment.

OIL BY HAND.

After stock has drained sufficiently and is ready to oil, take leather down, 10 to 15 backs at a time, and place on trucks and oil by hand, flesh and grain. Use all the oil you can put in the leather without running off on floor and streaking the leather. Three-quarters of a pound can easily be put to each pack. I use cod and mineral mixed, three-fourths cod and one-fourth mineral. In drying it doesn't require nearly so much forcing as vat leather. Drum stock will dry in one-third less time than vat leather, and it is an unusual thing to have any mold at all which will come on vat stock if it is not closely watched. I use the Baley hot air drying system and find it does fine work, far superior to steam pipes and natural air.

ROLLING.

Stock treated as prescribed in this article will show a gain in finished weight of approximately 75 to 80 per cent. Dip in water and roll, using just enough oil to keep the leather from getting dark under the roller. After stock has been rolled the first time it should lay over night in a pile, covered with a canvas. The following morning, roll the second time. If there is any dry spot dampen with water. Swab very lightly before putting under machine. After second rolling, hang up to dry in a room which can be heated to any temperature desired, but do not get room too hot, for leather dried in too much heat has a rough finish on grain and will crack much more quickly than if dried in ordinary heat of from 75 to 95 degrees. Some tanners claim that by drying in a hot room the leather will be firmer. That is true at the time, but if taken down and put in piles it will soften up again and the stock will be pipey.

TO ADD WEIGHT AND IMPROVE COLOR OF STOCK.

To put additional weight in the stock and make a big improvement in color, use the following formula: For dipping, size of dipping box, 5x5x8 feet long. Put 300 pounds quebracho extract, 300 pounds sugar, 100 pounds glucose, 100 pounds sumac, 100 pounds salts, 30 pounds sulphate of barium, or barytes, and 20 pounds talcum. The box holds 1,469 gallons filled to top, but I fill the box within four inches of top with water after all the above mentioned ingredients are in. Dissolve all together in box. With a brass pipe run in live steam and heat to 150 degrees Fahrenheit. Stir well so as to have a good mixture. Then measure and the solution will show 150 Twaddle test. Dip leather, keeping heat at 150 at all times. Put back in and keep under for one minute. Stir well after each ten backs. Continue this process until the solution is exhausted. Then make fresh solution, using same proportions as first named. Keep temperature up at all times. After

dipping in solution, take each back and rinse in second box of clear water. This is done to clear the grain, if any of the talcum stays on the surface, which it will do to some extent, and causes the leather to show a Texas bloom not desirable on scoured stock.

COSE DOWN.

After the dipping process cose down over night, then turn and sprinkle as the stock may require. It is apt to look dry and if so sprinkle heavy so as to roll the next morning after sprinkling. The leather must be rolled hard so as to get a nice finish and seldom do I find it necessary to roll the second time, as the stock is much harder than ordinary prepared stock and the solidity is excellent. The leather will have a close fine grain and color is without question unexcelled. If the leather is too hard it can easily be softened by rolling the second time after drying or partially dry, but I find the first method gives the greatest satisfaction to buyer and operator.

KEEP IN TOUCH WITH ALL DEPARTMENTS.

I have made the sole leather business a study and my experience is that when a tanner thinks he has his thumb on all the details and leaves everything to his subordinates, he is going to get a reverse and can't tell the cause. Consequently, I make it a practice to keep in direct touch with all departments and know exactly what treatment each pack gets, not because I lack confidence in the ability of my men, but if anything should happen I know the cause and can readily put a stop to the evil and avoid a lot of trouble and expense.

A PRACTICAL DRUM TANNER'S EXPERIENCE.

For drum tanning I use a drum of 6 feet 4 inches in depth by 7 feet 5 inches in diameter, running 14 revolutions per minute. After hides are put through the limes, either the Buffalo process or old-time 4 to 5 days liming, I unhair and bate in pool containing about 1,800 gallons of water. Heat to 75 or 80 degrees Fahrenheit. Make bate with 1 gallon lactic acid or one-half gallon dermiforma. Leave in bate 2 hours, then fine hair and hang in cold water over night.

BORAX MAKES GRAIN SMOOTH.

Put two pounds borax to each pack of 50 hides. The borax will make the grain nice and smooth. I take the hides from water and hang in a sour liquor in rockers or handlers 6 to 7 degrees barkometer. I leave hides in rockers or handlers 25 to 28 days. I have my liquors on head 28 to 30 degrees barkometer. Take hides from rockers and spread on floor so as to straighten the shanks and stretch out all bag

that is more than likely to appear. Then drop in vat of sour liquor strong as you may have. I usually put them in 36 degrees. Handle once each day and twice if convenient. This will help to plump the hides, besides cleaning the grain and causing the extract to penetrate easily when put in drums.

TOGGLING.

After 3 or 4 days' handling, take hides and crop for drums. Toggle with a brass toggle of ⅜-inch brass wire and made so as not to come loose in drum. I put the toggle through back of hide near tail and fold grain inside and fasten in shoulder near head; also fasten belly and butt near hind flank, but not in flanky part of hide. This is done to keep grain from being rubbed. I fill my drum two-thirds full of 50-degree wood or bark extract and add 600 pounds of quebracho extract. Dissolve the quebracho extract well if convenient before putting it in drum, but if not prepared to dissolve, I break it up in fine lumps. Put 1 gallon acetic acid in drum. Then run the drum for 24 hours unless the heat gets above 95 degrees. Should the heat rise to 95 degrees before the 24 hours are up, I stop the drum and open door so it can cool down as quickly as possible, but I try by all means to keep drum running continually, if possible, until the expiration of 24 hours. I then dump the liquor in vat under drum and pump over filter made of fresh-ground oak bark or new wheat or rye straw. Then I pump the liquors in mixing tank and strengthen to 60 degrees barkometer. Add 300 pounds quebracho extract, put back in drum and run another 24 hours with the same precautions as on the first run.

PUMP LIQUOR FROM DRUM.

You will find pumping the liquor from drum over filter into mixing tank will cool it down sufficiently for immediate use and it also cleans the liquor, for it makes no difference how clean the hides have been fleshed, a certain amount of flesh comes off in the drum, so I find it a good plan not to flesh too close for above reason.

I take the liquor from drum after second run of 24 hours and pump over filter to mixing tank. Strengthen to 75 degrees, add 150 pounds quebracho extract, 100 pounds salt and 50 pounds sugar, 10 pounds borax and run another 24 hours with same precautions as on second run.

When the time is up, again I pump my liquors as before to mixing tank and strengthen to 90 degrees and run another 24 hours and if heat does not rise to 98 or 100 degrees in 24 hours, I run until it does reach that point, but it very seldom takes longer than 24 hours. I then take hides from drum and stage down beside a vat of clean water. Let hides remain staged down for 10 hours covered well so as not to be exposed to air, then drop in water. Have three vats in a row filled

with water. Transfer hides each day from vat No. 1 to No. 2, and No. 2 to No. 3. Then take out and bleach. I put 50 backs to each drum and 200 bellies. Treat bellies same as backs, leaving off fourth run.

BLEACHING.

I use bleaching boxes 4x4x5 feet 6 inches in depth—two boxes for soda and two for acid. Put eight backs in each box, suspended so as not to touch each other. Fill first two boxes with clear water. Put in first box 25 pounds soda ash or 18 pounds Wyandotte soda; in second box 2 pounds soda ash, or 1⅓ pounds Wyandotte soda. Heat to 125 degrees Fahrenheit. Hang in hides and leave for 4 minutes. In the two acid boxes, put 25 pounds in first box and 30 pounds in second of sulphuric acid and heat to 125 degrees. Leave same time as in soda. Keep temperature to 125 degrees to put through 50 backs, then strengthen by adding 4 pounds of soda in first box. The second soda box doesn't need any strengthening at any time. To acid boxes add 4 pounds to first and 5 pounds to second. Continue until you have put through 1,200 backs. Then run off and make new solution.

Take backs from acid and put in clean, clear water for 3 hours, after which take from water and stage down to drain before oiling. I have used a wringer, but do not approve of it, as it drew the extract to surface and caused me a lot of trouble in my drying.

OILING.

Take the leather when in condition for oiling and put 20 backs in wheel. Put 15 pounds of cod oil, 25 pounds of sugar and 11 pounds of glucose in wheel and run for five minutes. The sugar and glucose should be dissolved together in a jacket kettle or large can in hot water with steam attached. Be careful not to get in any water, for the reason that it causes spots to appear when dry. After running five minutes, hang up and dry. Put a canvas around the edges to keep the air from darkening the edges. After the leather is dry, take it down and weigh it carefully to get the percentage, which is generally from 70 to 75 per cent.

SOLUTION FOR RETANNING.

Then make a solution for retanning. Take 185 pounds of sugar, 150 pounds of glucose and 750 gallons of water. Dissolve well and let it stand from four to five days. Then put in six backs, one on the other, and soak for about three minutes. Then take out the bottom back first, and the next, until all are out. Pile them on a platform so the solution can drain in a bucket and be poured back in dipping tank. Continue this process until the solution is exhausted, which will take about 300 backs, and then add sugar and glucose, which should be kept ready for immediate use in barrels, same as at first. This method should be kept up all the time while retanning.

When through dipping, hang the backs up and dry, which will take three days. Then take down and weigh again, which will give a gain of 4 to 5 per cent by loading heads and bellies according to pounds of dry leather compared with backs.

DIPPING.

Now the leather is ready for dipping for rollers. Fill a tank, 4x5x4 feet deep, with water, put in 200 pounds of salts and heat to 170 degrees Fahrenheit. Dip 300 backs, keeping temperature at 170 degrees all the time. Then cose down for 24 hours, after which turn them over and sprinkle with water all the dry spots and heavy part of the back, so as to have an even dampness all over the back. Cose down again for rolling the third day.

Just about two hours before rolling, pearline the flesh with the following solution put on with a brush made from a sheepskin: Take 5 gallons of water, 6 pints cod oil and 3 pounds pearline (Pyles is the name of the pearline). Mix this thoroughly and warm it well by setting in hot water. This makes the flesh roll down good and smooth and gives a fine color. Use a special sole leather oil for rolling, or cod is all right if the other is not at hand.

ROLLING.

Dampen the leather evenly, put oil on very lightly and let it lie until it is nearly all in before putting under machine. Then roll very hard. See that all rough places are down, especially in the neck. Then hang up all night and dry, at least until all the dampness disappears. Take down and gloss very lightly, being careful not to blister under roller, which is very easily done by having pressure part down. If this is allowed by the operator of the machine, dark places will be found when leather is hung up and dried, which should be done right after second rolling.

LEATHER EQUAL TO VAT-TANNED.

If the above methods are carried out, the sole leather is equal in color and solidity to any vat-tanned from any tannery. The writer had a pair of jumbo soles. I took one jumbo sole and one of my own tannage, and had them put on my shoes. My own leather was not near through when the jumbo was gone. I tried it a second time with same results. Therefore, I claim it to be far superior in wear, just as nice looking in color and finish, and tanned in one-third the time with less labor and about the same percentage of tanning.

The writer believes the time is not far distant when all heavy leather, such as sole, belting and harness, will be tanned in drums and the tanner who is first to commence is the man who will be in the lead.

DRUM TANNAGE OF SOLE LEATHER.

The struggle for a quick tannage with increased weight for sole leather has led up to filling the hide with weight-giving tanning materials by the use of drums.

It has long been known that in stuffing leather many more pounds of grease could be forced into the goods by drum stuffing than by the old hand method. It is the same in tanning hides, more filling can be forced into the fiber by the use of a drum than can be absorbed by the hide naturally.

DRUM TANNING WITH STRONG EXTRACTS.

Drum tanning of sole leather with strong extracts has attracted the attention of tanners for a number of years. It has been found that when green hides were placed in the drum and the drum run continuously for a time the green stock commenced to warm up and became injured. The grain was pebbly and the skirts coarse and flabby.

A number of sole leather tanners today that are using the drum for hastening the tanning process use the drum only after the hides have been struck through with the tanning liquor, and only for about ten to twelve hours' continuous drumming.

SUSPENDED ON STICKS.

The green stock on coming from the beamhouse is suspended whole on sticks in the plumping liquors. After the stock is well plumped, and the grain set, the stock is shifted forward into a liquor of fairly good strength. The hides are moved forward into stronger liquors for five or six days, when the raw hide has been struck through. The leather is now ready to be filled in the drum with strong extracts which produce weight.

A drum with a drop of seven to nine feet is not suitable for filling sole leather, since in such a drum the leather is subjected to much pounding, making it mushy and soft.

SATISFACTORY DRUM.

The drum which is giving good satisfaction for the purpose of tanning sole leather is one ten feet in length and four feet in diameter, containing pins in staves and ends of sufficient length to prevent the leather from moving about too much.

Extracts of full strength are milled into the leather, and after drumming the goods for ten to twelve hours the wheel is stopped and the leather allowed to remain in the drum until the next morning. The next morning it is taken from the drum, rinsed and split into sides down the backbone, and hung up to dry. It is claimed by drying the leather at this stage, instead of bleaching and then drying, that more filling matter is retained in the body of the leather.

BLEACHED IN WOODEN TANK.

After the leather is dry it is bleached in a wooden tank built for the purpose, oiled on the grain, and again hung up to dry. After being carefully dried it is dampened, sammied and rolled.

For sole leather a good even color is essential as well as weight, and in depilitating the hides tanners strive to hold all weight-giving substances. The soaking must be thorough to remove salt, blood, etc., and the hide itself in a good, soft condition for fleshing.

FOR STARTING THE HAIR

many methods are in use, such as sweating, sulphide of sodium used in the form of a paste on the hair side, sulphide of sodium used in the limes, also mixed with water, making a solution that reduces the hair to a pulp in a day or two, according to the strength used.

For the solution enough sulphide is dissolved and mixed with water to bring it to 3 or 4 degrees Baume, the hides are placed in and paddled at intervals until the hair starts easily.

In using sulphide of sodium in form of paste on the hair side of the hides the hair is reduced to a pulp in a few hours. This pulpy mass is washed from the grain by the use of the wash wheel. This method, although the hair is removed, does not remove the scurf and natural grease contained in the hide. The same is true in the case of using the sulphide as a bath, the grease in both cases being left in the hides in the form of soap, and must be removed if plump leather of clear grain is to be manufactured.

LIME IS A GREAT KILLER OF GREASE.

and it also changes sulphide of sodium to caustic soda, which is easily washed from hides by the use of warm soft water. The proper method is, in this case, after the hair is removed, to place the stock in white limes of good strength for twenty-four hours. This swells the fibers, opens the pores of the grain, kills the grease, and the scurf and short hairs give readily in the working out.

Sulphide of sodium used in connection with lime in lime liquors changes to caustic soda by decomposition, and the combination has a rapid effect on the hides, hastening the liming process.

If one should have a preference for caustic soda, instead of sulphide of sodium, it is much better to use caustic soda in the form of soda ash for sharpening the limes.

SOFT WATER FOR RINSING.

From the limes the hides should go into soft water for rinsing previous to unhairing. Hard water at this point is the cause of many tanners' troubles. Chemistry has proven that if lime hides are placed in hard water chalk of lime is formed in the fiber, which cannot be

removed even when a bacterial drench is used. The acids contained in an old bark liquor counteract and dissolve this chalky substance, but when one is depending on extracts for a tannage these acids do not develop in the liquors.

BORAX PREVENTS CHALK OF LIME FORMING.

Borax used in the water, be it soft or hard, prevents this chalk of lime forming, softens the grain which has been roughened by the lime liquor, so that it gives readily under the unhairing knives, allowing the short hairs and scurf to give readily. A large amount of lime is neutralized, which helps in the drenching. In the drenching or deliming of the hides all possible hide substance must be retained.

For this purpose boracic acid is coming rapidly into favor. It is a deliming agent which gives good color to the leather and is safe to use. It should be used in the paddle wheel to prevent uneven drenching and the green hides should be taken from this solution as soon as all trace of lime has disappeared.

DRUM TANNAGE IN SOLE AND BELTING LEATHER.

A practical man gives his experience as follows:

Drum tanning is a safe and quick way to produce sole or belting leather. In using quebracho extract, 85 per cent, and oak, 15 per cent, a first-class piece of leather can be made by following this process: After putting hides through the beam shop, for handlers hang hides in a 4-degree liquor made of quebracho and oak extract as mentioned above.

PREPARING LIQUORS.

In preparing liquors, mix and let the liquor stand from five to six days in coolers or storage vats to sour. Put 3,000 gallons of 4-degree liquor into cooler, four gallons acetic acid, one gallon dermiforma. After standing five or six days, run on green hides. Strengthen each day with enough liquor to fill rocker for green hides in turn. Raise liquor 3 degrees each day until strength is up to 20 degrees barkometer. Add every day one gallon dermiforma and one and one-half gallons acetic acid. Then feed from head rocker, keeping liquors at 20 to 22 degrees. Never have the tail handler over 4 degrees, as quebracho penetrates much faster than oak extract. It is safe if tail falls to 3 degrees, but I make it a plan to keep tail at 4 degrees. I use ten rockers in a section and let hides hang for twenty days. Then take hides from rockers and crop for drums. Put fifty backs in a drum, fill drum two-thirds full with 75-degree liquor and run for forty-eight hours without changing liquor, but watch heat and don't let it get over 105 degrees Fahrenheit. After forty-eight hours are up,

run out all the liquor and fill again with 75-degree extract. This time only fill the drum half full. The drum should be large enough to hold twenty-five barrels when half full. This time run twenty-four hours, and I have yet to see the hide that is not fully tanned through. Besides, it will be plump and of fine color.

TOGGLE WELL.

The hides must be toggled well together, grain inside, so as to prevent any grain from being damaged by rubbing together. After seventy-two hours' run, take leather from drum and lay away in a 75-degree liquor for four days. Put 300 backs in a vat, 8 by 9 by 6 feet deep, using fifty pounds sumac to 100 backs. On the fourth day raise stock and run through a wringer and put back in drum. Put in three and one-half pounds quebracho extract (dissolved and not diluted) to each back. Put fifty backs in drum and 175 pounds extract, and run thirty minutes.

SOUR LIQUOR.

Then take from drum and throw in a sour liquor. It will be found that by running backs through wringer or press, the extract will go in much better, and there will be but very little on the surface. The sour liquor should be about 25 to 30 degrees barkometer. After laying in the sour liquor for twenty-four hours, the leather is ready for bleaching. I have tried this stock through bleachers without scouring, but where a first-class color is required I find it a good plan to scour very slightly on grain.

BLEACHING.

I use the same bleach as on other stock. Have one box holding 750 gallons of water, and two soda and two acid boxes. Put twenty-two pounds soda ash in first box and three pounds in second. Put thirty pounds sulphuric acid in each box and heat to 125 degrees temperature. Hang eight backs in each box, strengthen after every forty backs, putting four pounds soda in first box, but none in second, as pulling stock from first to second will keep all the soda required in second box. Also put four pounds acid to each box for every forty backs. Take from box and put in clear water for two hours. Then oil. Put through press or hang up to drain. I prefer the latter method, as the press will draw some extract to surface more or less. Yet I use the press and get good results. However, I would advise hanging and draining the stock if there is room to spare. In oiling I use three-fourths pound of cod oil. Sometimes I try cod and mineral mixed and get very good results, but not as good as when I use cod alone.

As to sugar and glucose, I have used it in different ways and find putting it in with the oil and wheeling it in is the cheapest way, but the results will be obtained by retanning.

ROLLING.

After leather is dry, take and dip in water for rolling. Prepare in the usual manner and roll. If properly looked after in rolling room, the backs will look just like vat-tanned oak backs, only they will be firmer and of a brighter color. I make from 70 to 75 per cent finished grains with this process.

In talking with a tanner making sole leather by this process, he said he could make all the weight he wanted. The only trouble he experienced was in regard to color, and I find this the simplest part of the business. I also know a sole cutter that is cutting the stock I just referred to, and he claims to be able to handle the entire output of this tannery and could handle more. I have tanned belting butts by using this process, and the only difficulty I had was in tearing out the toggle hold and graining hide. These butts were made by a large beltmaker into belts and gave good satisfaction.

DRUM GOOD FOR SOLE LEATHER.

I have been using extracts of all kinds in vats and drums for the past fifteen years and find the drum all right for sole leather tanning. I have made as fine leather in drums as I ever saw made in vats by anyone, and I claim that it is just a matter of a short time until the drum will be the predominating factor for heavy leather tanning. A good many tanners are already using them in a small way, while others are using them extensively. They are a new thing, but like the stuffing wheel for harness leather, they have come to stay.

PREPARING DRY OR GREEN HIDES FOR QUICK TANNING.

In preparing dry or green hides for quick tanning, of sole leather and belting, the soaking is done in the usual manner, says a practical tanner.

For green hides I soak two days or less, according to the temperature of the water. It is important that every tanner should keep posted on water temperature and not take chances in this direction.

After soaking I use a hide wheel, which saves time and labor, and cleans hides effectively before entering the limes. I flesh before liming and use sulphide of sodium in the lime, which gives a mellow grain. I give six days' liming, using the last day for warm bath of water

with temperature 80 or 85 degrees, leaving the hides in hot water for six or eight hours. Unhair and wash in wheel for 15 minutes, and then give the green stock a bath of cold lactic acid for 15 or 20 minutes and then finish by working grain on the beam. I find it convenient in the beamhouse to reel hides from lime to lime by sprocket and chain, as this saves time and labor. In hides for belting I flesh before liming and also afterward, just before putting into the extract.

In handling such hides I soak four or five days with about a bushel of salt to each pack of 60 hides. The salt helps preserve the weak spots, which are often found in such hides. After the dry hides are thoroughly soaked I split and run in hide wheel for one hour, with water, and from five to six hours in mill without water, or longer. Some hides take longer to soften than others. In milling when the head and shoulders are soft and the hides themselves are quite warm this is a sign that the milling should stop. These are just a few suggestions from which some tanners may possibly get a point or two.

STRUCTURE OF HIDES AND SKINS.

In talking with many tanners I have found that there is a woeful ignorance among them concerning the technical structure of the animal hide or skin. It really is surprising, considering the inquisitiveness and push of the average American business man, that tanners are not better posted on a subject that concerns them so intimately. Some few understand the subject thoroughly, but there are more to be found who are simply indifferent, or, having a few hazy ideas on the subject, are too lazy mentally to investigate further.

I have heard some tanners say: "What difference does it make to us whether one particular part of the skin be called 'epidermis' and another 'dermis,' or whether these names be reversed, or whether they be interchangeable? We are after results."

Now it is quite true that "we are after results," and it is also true that what we should be after are best results. Now, how are best results to be obtained today, by plodding along in old paths, by groping along blindfolded and unequipped in new ones, or by carefully following along in the new paths well equipped, with both eyes open? Nothing, of course, can take the place of practical experience. We not only need our own practical experience, but we need to know something about the practical experience of others. We need to work, and we need to read, and read understandingly, and in order that we may read understandingly on this particular subject especially it is necessary that we have fixed in our minds certain arbitrary terms. Unless we understand and adhere to these terms, our reading may be quite as unsatisfactory as would mathematics if we had no settled

and definite name for the figure 2, or any other figure, for that matter.

PRINCIPAL LAYERS.

The first thing we should fix in our minds concerning the structure of the hide is that the two principal layers of which it consists are called respectively the epidermis and the corium, also called the dermis.

THE EPIDERMIS

consists of two layers, a hard outside and an inner mucous layer. In the living animal the outside exhausted layer of the epidermis is continually being thrown off in dead scales, but as fast as thrown off the loss is made good from the mucous layer below. Now, many are possessed of the idea that the mucous layer of the epidermis is in its turn replenished from the corium or true skin. This, however, is erroneous. According to the best authorities the epidermis has at no time been a portion of the corium. Even in the embryo it was a distinct layer, and its source of increase is in the multiplication of the cells of its mucous layer rather than, as is supposed by some, in the corium or the true skin.

THE CORIUM.

The real hide proper, or corium, consists of two layers, principally made up of bundles of white fibers. These fiber-bundles interlace. Each individual bundle consists of a number of extremely fine fibrils cemented together by a substance known as coriin. This substance differs from the fibrils themselves and is commonly referred to as "cementing tissue." The bundles of fibrils or fiber-bundles are often referred to as "connective tissue." The interlacing of these fiber-bundles is not the same throughout the corium, the bundles being most loosely interwoven in the inner or middle portion of the hide or skin and most closely interwoven just beneath the epidermis, from which it is separated by an extremely thin membrane.

THE GRAIN.

Now, it is this portion of the corium just beneath the epidermis, together with the very thin membrane spoken of, which forms what is properly called the "grain" of the hide or skin. I have heard tanners say that the "grain" was the under portion of the epidermis, but this is not so. The epidermis must be completely removed before tanning, in order that the hide or skin may be properly freed from the hairs—a portion of the hair sheath being a continuance of the epidermis—while it is extremely important, on most classes of stock, that no portion of the "grain" be removed, and especially that the thin membrane be not injured. I have said that it is the closely inter-

woven portion of the corium just beneath the epidermis, together with the very thin membrane separating the two, that forms the "grain." In this closely-interwoven portion the fiber-bundles have separated into their individual fibrils, and it is these individual fibrils that are interwoven in this portion instead of the fiber-bundles; so close is the arrangement that the fibrils can scarcely be distinguished.

OTHER CONSTITUENTS.

The hide or skin, of course, has other constituents and properties than those mentioned here. Among them is a small portion of fine yellow fibers often called "elastic fibers," but in the manufacture of leather it is chiefly of importance that we should be familiar with the terms and constituents already mentioned. Too minute, technical and hair-splitting articles are apt to be confusing rather than helpful.

TO SUM UP.

Perhaps it will not be out of place to sum up a little here: Two principal layers of the skin—epidermis and corium, or true skin—separated by an extremely thin membrane; epidermis made up of two layers—outer exhausted layer, inner mucous layer; corium made up of two layers consisting principally of bundles of white fibers termed "connective tissue fibers cemented together by a substance technically termed coriin. The uppermost closely-interwoven layer of corium, together with membrane which separate corium from epidermis, forms what is termed the "grain" of the hide.

The connective tissue fibers of the corium are not soluble in pure water, although they will, of course, decay. They are insoluble in lime water or weak solutions of sulphide of sodium. By the action of a highly concentrated solution of sulphide of sodium, however, they are partially converted into gelatine. By the action of weak acids they are first swollen and then dissolved.

ACTION PRODUCES DIFFERENT RESULTS.

The action of most of these substances on coriin produces very different results. For instance, coriin in its natural state is easily dissolved by lime water and by weak solutions of sulphide of sodium, also by pure water; but it is not dissolved by weak acids, although it is swollen much more by weak acids than are the connective tissue fibers.

I here say coriin in its natural state. I qualify thus for the reason that coriin may be so changed by the action of a high degree of heat as to become almost insoluble. Corium when subjected to extreme heat becomes absolutely insoluble.

ADVANTAGES OF UNDERSTANDING.

It can readily be seen by all progressive tanners that, in order to achieve the greatest degree of success today in the manufacture of different leathers called for, one must understand thoroughly the structure of the hide and the action produced by the different chemicals in use. Where these things are understood not only is better leather the result, but a man is far easier in his mind. He is not kept guessing as to the results of his operations.

Extract Tanning.

POINTS ON USING EXTRACT.

Good selling and good weight leather may be produced from hemlock, oak or quebracho extracts. Quebracho, however, is seldom used alone, and it is by far safer to add a percentage of other extracts with it. Hemlock and chestnut oak extracts work very well in combination with quebracho and generally one-fourth or over of the former is employed with the latter. Extract liquors must be used very weak at first and should be strengthened very slowly. Quebracho liquors, if used too strong when the tannage is commenced, have a tendency to draw the grain firm, which not only hinders the tannage, but produces brittle stock. As the tannage penetrates further into the hide the strength of the liquors may be increased. The outside of the hide must first be protected against the action of the stronger liquors. Exact figures on the amount of leather to be gained from hides can hardly be given, as the amount varies according to the condition of the hide as well as the tanning material. A fair run of hides, weighing 100 pounds beamhouse weight, ought to produce about 30 per cent of dry leather and require about 35 pounds of extract.

QUEBRACHO EXTRACT TANNAGE.

On hundred pounds of dry stock should give about 125 to 130 pounds dry leather. This would require about 65 pounds tanning agent, which is contained in a 93-pound quebracho extract (70%). The exact amount of extract required the party might get by having it tested, which might prove more valuable than receipts.

From 100 pounds dry cowhides 165 to 175 pounds good harness leather, owing to increase of weight by stuffing. The same about the other statement, 62 to 65 pounds sole from 100 pounds salted hides—the proportion of salted: dry nearly as 2 to 1.

CRACKING.

As to the cracking it is still more difficult to locate the trouble. The water might not be sufficiently clean for tannery use, containing

iron or animal matter, which latter forming in the last ammonia attacks the albumen of the hide. In the further process possible mistakes, mentioned in the preceding answers, such as hides not being thoroughly soaked, not sufficiently delimed, etc., are to be avoided by adding sulphide of sodium (free of iron) to the soaks—2 sulphides per 1,000 water, and rinsing them in clean water before bringing into lime. Use of salt in the soaks is to avoid. Deliming may be accomplished by giving bath of lactic, or muriatic acid, strength not over 1%, cleaning afterwards in fresh water.

SULPHURIC ACID IS USED.

But most probably the cause might be with the extract. We have to remember that quebracho, and so much more its extract, does not contain sugar enough to form acids necessary for plumping or swelling the hides in the suspenders. Sulphuric acid is used generally for this purpose, but in very moderate doses, bearing in mind that the naturally formed mild organic acids do not go above 0.5-1.5% in this stage of process.

The action of sulphuric acid is rapid, and by too strong doses, or if too long a lime applied even destructive, as sulphuric acid is forming with albumen insoluble compounds. Now here we need both acid and tanning agent, and it is here where the liquors should be kept to resemble most the composition of the old liquors used in the yard. Acid is swelling, tanning agent tanning. Thus if by chance one of those adversaries is stronger than the other, its action prevails. If acid, the stock swells too much, thus becoming brittle. If tannin is the boss, it tans the outer layers, causing raw places in the center of the hide, and hides go down. Barkometer, though reliable, gives only the gravity, which is affected by any substance soluble in water, so it is easy to understand that there is quite a difference between a 5° bark quebracho extract solution and an old used bark liquor showing 5° bark. So the results obtained by either must be entirely different. The addition of sulphuric acid to the tanning liquors would be entirely wrong, as this would precipitate the tanning agents, and result in dark, brittle stock.

ADD GOOD COARSE GROUND BARK.

The addition of good coarse ground bark, which would readily dissolve the sugar desirable for foundation of acids, and retain the tannin, or addition of fermentable substances forming desired acids, or last, not least—the addition of lactic and acetic acids would be advisable. Amount of bark would be 30 to 40 pounds per vat, that means only in the head liquor, and let it remain there until it reaches the tail. For the first there would not be acid enough, so it would be good to let that liquor stand some days before using, or still better, have a

separate vat filled with suitable bark and water, and when sour give sufficient quantities to the head liquors. Acid and tanning agent holding the balance, strength gradually increasing until hides are in shape to get in place of layers, stronger and stronger sweet liquors where there is no danger any more for them to fall.

HIDES SHOULD BE TESTED.

When the gravity of the liquor remains the same there is the sign that the hides have all they want. Rinsing them off in a weaker liquor, say, about 18° Bkm., and a coat of oil on grain, drying slowly, should further prevent the cracking. To locate the cause the manufacturer should test his hides at different stages of the process.

USE OF CHESTNUT EXTRACT.

The use of chestnut extract in heavy leather tanneries is rapidly increasing, owing largely by the efforts made to find a tanning agent that would be more pliable under new conditions than bark, and easy and satisfactory to use.

There were defects incident to the early introduction of chestnut extract, but the growing knowledge acquired by careful experiments conquered all obstacles until now it is possible to make high-class marketable leather with extract either alone or in conjunction with bark. Since there are various ways of using extract the enumeration of the more common methods may be of interest.

COMMON METHODS.

By some, the extract is put directly on the leaches and there allowed to dissolve and percolate through the ground bark. The chief advantage claimed for this is that the disagreeable bluish-gray color on stock is thereby avoided.

Other tanners dissolve the extract in a separate tank and then run on the leaches through the sprinklers. Some prefer to dissolve the extract separately, then mixing with bark liquors as they come from the leach-house.

But these methods, although progressive, have not quite fulfilled the expectations tanners rightfully have entertained of the true tanning value of extract, and there has consequently been a steady experimenting along new lines of adaptation. Under these later methods the beam-house work is practically the same as under any system.

HIDES CAREFULLY SOAKED.

The hides are first carefully soaked after which they are washed in a paddle wheel. Whether lime or sulphide of sodium is the depilating agent, the hides are well worked on the grain after unhairing,

then left hanging over night in a cold water pool, to which a certain quantity of commercial lactic acid has been added. For ordinary packs forty pounds will be sufficient. As they are thus plumped and also have the fixed lime neutralized, the ordinary time in the handlers may, with safety, be materially reduced.

Coming from the cold water pool the hides should again be worked on the grain before going to the liquors. The green pack is given a week in the handlers, which are soured to the proper degree by the addition of lactic acid. The hides go from the handlers through the first two layers, after which they are run through a roller-press and are then ready for the drumming process.

The extract is poured into hot water and the solution run on the stock through the gudgeon at about 16 degrees. At first the wheels are revolved slowly. The two essentials, at this stage of the process, are the maintenance of the liquor strength and keeping the stock comparatively cool. After running until hides become warm they should be withdrawn for sufficient length of time to cool. During this interval the old drum liquors are run to the handlers and new liquor supplied the drums.

ADVANTAGES OF THE DRUM SYSTEM.

After the leather is thoroughly tanned, weight is given by putting it in drum with a certain amount of undissolved extract and then run long enough to have the leather take up the extract. The leather is then finished same as usual.

One of the advantages of the drum system is that entirely sweet liquors can be thus given to the stock since the natural resistance of the fiber to the penetrating power of the tannin is overcome by the attendant agitation. However, it can readily be seen that the old drum liquors sent to the handlers will not contain a sufficient amount of free acids, other than tannin, requisite for the holding of the proper plumpness of the hides; hence it is necessary to add lactic acid to the handlers in order that the proper relation of the acids may be maintained.

ADD COMMERCIAL LACTIC ACID.

As there is an absence of natural lactic acid, best results will be obtained by adding the commercial lactic acid to the head handler liquor in the proportion of one pound of lactic acid to every 100 pounds of hides, green weight. Besides adding to the head handler liquor, it is advisable to add lactic acid to the other handlers half way down the series, in amounts growing smaller going from the head.

Chestnut extract has been made commercially for some little time, and the old-established factories, by their combination of technical

skill and practical knowledge, have raised the general quality of their product to a high degree of excellence. The tannin in chestnut, although not reading so high as some extracts, is, nevertheless, so easily available that it is one of the most acceptable on the market.

A PRACTICAL TALK ON EXTRACT TANNING.

A successful extract tanner gives his experience as follows:

Extract is becoming more and more valued and appreciated by practical and enterprising tanners every day. Time was when tanners fought shy of it, simply because they did not understand how to work it to best advantage. Today there are tanners using extract almost exclusively, merely chopping up a little bark for filtration purposes.

I have been employed for several years in one of the largest exclusive oak sole tanneries in the country, where extract does all the work. During this time I have had the benefit of many costly and valuable experiments with extract, both on regular and short time tannage. What I shall say at first will be along the lines of regulation tannage, which takes time for the making of leather; quick tannage will be discussed later on. I have learned everything from experience, and wish to state right here that to use either bark or extract successfully tanners must be thoroughly practical and know what they are doing, and not leave too much to those whose judgment may be faulty or lacking.

It has been truthfully stated many times in *Hide and Leather* that tanners have often burnt their fingers by adopting risky new processes. I have witnessed some expensive demonstrations in this direction, but it seems as though many lessons are not thoroughly impressed upon the memory unless a heavy price is paid, as a kind of penalty for pioneering along untried paths. While thousands of dollars have been sunk in the effort to make better leather at lower cost, it is but fair to state that such courageous investigations have been of great instructive benefit to employers and employes, and it cannot be denied that after all it is the live and up-to-date tanners who are not afraid to venture, who are prospering in the tanning business today.

I have in mind one of the largest sole leather concerns outside of the United States Leather Company which has achieved marked success. It has large capital, on which satisfactory dividends have been paid regularly for the past ten years, while the capital itself has been doubled. This wide-awake concern is continually in the market for new and practical information in the direction of improving its leather while possibly cheapening cost of production. It avoids the narrow policy of watching the cent in hand while missing the dollar in the distance. It is the progressive and courageous tanner, who is

mounting the ladder of success today and he need not complain if a few false steps check his advance for the time being.

My first experience in extract tanning is still vividly before me. I began using 40 per cent extract and 60 per cent bark, and we achieved wonderful success—good weight, fine color, and satisfactory plumpness. The result was gratifying, and I would advise all bark tanners who are turning their attention more and more to the use of extract to begin as I did, in a careful and conservative manner.

Never change your methods too suddenly. It is better to keep replacing bark with extract by degrees and thus make sure that each step is all right. It is necessary for tanners to keep intimately in touch with the workings of their liquors, so as to prevent being disappointed by results.

DIFFICULTY OF MAINTAINING DESIRABLE COLOR OF LEATHER.

One of the greatest obstacles which tanners encounter when first using extract to much extent is the difficulty of maintaining the desirable color of their leather. This, however, can easily be done by keeping the liquors clean. Filter your extract liquors through chips, bark or straw—any of these materials make a good filter, but I prefer ground bark or straw. This is a simple suggestion, but it should be remembered. Some tanners get discouraged because they fall down on their early experiments, but the man who succeeds is the one who deserves to succeed, by sticking at obstacles until they are conquered, and it is wonderful how difficulties diminish when one takes them manfully.

KEEP HANDLERS CLEAN.

I differ with many old-time tanners regarding the cleanliness of handlers. I want mine to be clean and kept so. Although some foremen claim that this means serious loss of acid, I consider it wise economy to let the old wash liquors go to the sewer.

Keep your handlers clean and it will be dollars in your pocket. I have yet to see good results come from the continued use of dirty or filthy handlers. This idea of nursing dirty liquors is in keeping with the old superstition about retaining old limes. My readers probably know of tanners who even in these days of enlightenment and technical trade papers let their limes run six months before cleaning. Make no mistake, my friends. You cannot make sole leather that will successfully compete in the market today by slovenly methods.

We tan our packer hides with three, four and five layaways, and I find that 95 per cent extract and five per cent bark works nicely. The bark is merely for filtration, while the extract does all the tanning. It is very interesting to tan leather with extract alone and thus save many expenses connected with storing, grinding and leaching bark.

GOOD AND BAD FEATURES OF EXTRACT TANNING.

In the beginning we wish to say again that the tanner who does not use extract of some kind and quantity is scarce and hard to find in this country. A great many of them have been forced to use it on account of the scarcity of bark in their section. Others have adopted the use of extract to strengthen up their weak bark liquors, as they found to increase the strength of their liquors shortened the time required to tan a heavy hide. The day of 20 degree barkometer liquor for last layaway has gone and is numbered among a great many old rules which tanners have discarded in the last five years.

The tanner has experimented with the different kinds of extracts until he has found the kind best suited to his uses and by using same carefully he has been enabled to produce a grade of leather tannage. So as their bark supply decreases, tanners increase their use of extracts and yet produce a bark tannage. Experience has taught tanners that a proper combination of quebracho and that cannot be told from the old bark chestnut extracts produces an excellent oak tannage.

The scarcity of bark has not been the sole factor in inducing tanners to use more and more extract, but a great many of them have found the cheapness in handling extracts to be quite an item which could not be overlooked.

CLAIM FOR EXTRACTS.

Now to our knitting. We claim this much for extracts: It enables the tanner to reduce the time of tanning a heavy hide from six or seven months down to thirty to sixty days for a good quality of oak leather; that sole leather made with extracts has just as good wearing qualities as an old bark tannage, and you can tan cheaper than with bark and reduce the amount of capital one-third of that formerly employed.

Here are a few figures: Suppose I am tanning 300 hides per day and turn out my stock in sixty days. You will readily see I have 18,000 hides in process, which, at $9 per hide, would mean $162,000 for hides alone, not to mention extracts, labor and other expenses. Now, if I turn out my stock in 120 days I have just twice as much invested, and so if it requires six months to turn hides into salable leather it requires three times the capital. Now, at 5 per cent interest on $162,000, we have an interest account of $675 per month. If we are ninety days turning out our stock our interest account will be $1,012; if 120 days, $1,350 per month on stock in process, and the longer we are turning out our stock the more vats and extracts we must have, and all tanners know what they must "put up" for a carload of extract.

SAVING BY USE OF EXTRACTS.

Now then, you can readily see what you are enabled to save by the use of extracts. If you are running your stock four months, you can cut the time into half, and tan in sixty days. This can be easily done in vats and still retain the color and fiber by using the proper combination of extracts. You can also use ground bark as a duster in the layaways and keep your leaches in operation as filters, grinding a fresh leach every few days, and still have a pure bark tannage.

We have told you that a good salable bark tannage can be turned out in sixty days by the use of extracts in handlers and layaway. Now we are going to tell you that good leather can be turned out in thirty days by the use of vats and drums and that very little damaged stock results from the drums. As we have said before, tanners have spent thousands of dollars experimenting with drums and drum tannage, and their experience has taught them what size is best suited for a tumble drum. Some tanners have discarded the drums they put in three years ago and have put in new sizes, and some are yet using the ones they put in on the spur of the moment, hoping to get some returns from their investment, while there are others who go right on running their drums night and day and have their output sold ahead at profitable prices. Still others have discarded the drums altogether and have returned to vats.

BOTH VATS AND DRUMS USED.

We do not know of any one who uses tumble drums without getting some damaged leather. Some have a very small per cent; others have so much their drums are not profitable to them. Here we wish to say that we are users of both vats and drums. We run our drums right on, night and day. In fact, that is the only way to get good results from drums, and our percentage of damaged leather varies from drum to drum. Our experience has taught us that to get good results from drums requires constant watching, but, as we said above, we have some damaged leather. Here we are going to give some of our experience. We have found that very little damage results from drums under twenty-four hours' run. It does not matter a great deal how you have them in the drum—whether they are pinned up, tied up or thrown in loose, or any other way. At about twenty to twenty-four hours' run the leather begins to plump and harden up and when it reaches this stage your damage starts, and the longer you run it after this the more you damage the leather. This is the case with the size drums commonly used. We run our stock in drums from thirty-six to sixty hours and we get less damaged stock from those we run sixty hours than the ones we run thirty-six hours, and we place the hides in both drums alike.

WHICH METHOD IS MOST PROFITABLE?

Now the question naturally arises at this point, which is the most profitable method of tanning, vat or drum tannage, or vats alone? As we have said, it is possible to turn out a good vat tannage in sixty days (when we say a good vat tannage we mean one that will compare with the old six-month vat tannage in every way), and a good wheel or drum vat tannage in twenty to thirty days. We will give you a few points as we see them and leave same with you for your further consideration.

VATS AND DRUMS.

1. Vat and drum tannage requires one-third to one-half less capital.
2. You always have your stock on the market thirty days ahead of the vat tanner.
3. The leather is equal in wearing qualities to any.

VATS.

1. With vats you have less damage. You have no pipey grain at all if handled properly.
2. It requires one-fourth less power to operate the plant.
3. It does not require the constant attention that drum tannage does.

In conclusion, we wish to say that we are vat and drum tanners and are getting as much for our leather as any tanner we know of. We tan with extract exclusively. However, we do not condemn the bark tanner, but wish to say that extract is king today as a tanning agent for sole leather, whether it be by the use of vats or drums.

A closing remembrance—the tanner who has made a success of drum tanning has let no grass grow under his feet.

IMPORTANT SUGGESTIONS FOR BEAMHOUSE WORK IN EXTRACT TANNERIES.

Beamhouse work in extract tanneries is not unlike similar work in ordinary bark tanneries. At the same time, there may be some differences worth noting, but rules which obtain in one shop might not be adaptable elsewhere on account of location, climate, water, etc. The live, wide-awake tanner knows how to make the most of such opportunities as are before him and from time to time he may be able to develop ideas which may be termed fairly original. Some tanners are very close-fisted in regard to imparting results of experience, which have often been expensive in time and money. This policy, however, is somewhat narrow-minded, as it pays better for

practical tanners to work together for mutual advantage and to exchange ideas, rather than stand aloof and act as strangers to each other.

I firmly believe that extract tannage will be the popular process among heavy leather tanners and those who succeed in achieving best results in the use of extract will reap the reward of their ability and enterprise.

PLACE HIDES STRAIGHT AND FLAT AS POSSIBLE.

Coming back to the limes, I would urge that all hides be placed as straight and flat as possible in the pits. This is not easy where small limes are used, but there should be no excuse for hides being reeled over and dumped in a pile into the pit. This is a serious mistake and if limes are too small for the purposes required, it will be cheaper to enlarge them. Every part of the hide should be limed properly. Small and cramped pits are often responsible for baggy stock which too often makes leather salesmen despair of finding customers for such material. Extract tanners need hides as flat and straight as possible and free from wrinkles, or else they will have pipey grain when the raw material goes into tan.

To make up fresh or new limes, I use ten bushels of lime for every 100 hides and strengthen daily. We lime our hides from three to five days, according to the temperature of weather and water.

SPLIT HIDES FROM TAIL TO HEAD.

If hides are split from tail to head before being limed they are somewhat easier to handle in the limes. Tanners differ on the question of fleshing directly after the soaking or after the liming. Tanners in England, I understand, flesh out of the limes when the hides are plumped up and the flesh can be easily scraped or cut off by a sharp knife. Green fleshing is usually quite satisfactory and the workers are more apt to push or scrape the meat and fat off the hide and not use the cutting blade. After unhairing, we throw our packs into a cold water pool and next day fine hair them on the grain and clean the edges of hair.

Before sending hides to the handlers they should be thoroughly soaked and cleaned by water, so as to rinse all loose lime, and the colder the water the better. If you wish to bate, better do so before fine-hairing on the beam. Would explain that I have been accustomed to split the hides from tail to head after they come out of the limes to be unhaired.

TO PREPARE FOR THE HANDLERS,

tack the green sides on sticks to hang in the handlers, and let me say here that great care should be used to tack straight on stock and get nails as close to edge as possible. As soon as tacked, the sides should

be put in liquor as promptly as possible but do not wait for the whole pack to be done or you will run the risk of more or less stains on the grain. See that each side or hide hangs down straight. Remember that it is much easier to get pipey grain in green stock than to get it out when the leather is finished. Some tanners make the mistake of letting the small details of their business be done carelessly, thinking that it is enough to watch the big ones.

DO NOT CROWD HIDES.

It is a mistake to crowd too many hides into the first or what is called the tail handler. The liquor in this tail handler is, of course, very weak and contains little tanning, but much coloring matter. The great object now is to set a nice color on the grain. Some tanners insist on forcing a large number of hides into comparatively small vats on account probably of being short of vats or short of liquor. This is poor reasoning and liable to prove expensive in results. Young stock requires respectful treatment and an opportunity to develop in a natural and healthy manner. I would suggest that if crowded for room, certain handler vats be set aside for receiving green stock and that they be amply large, so as to give the young stock a fair chance at the start. There is no excuse for making stained leather, and once made it is difficult to remedy.

CAREFUL WORK BRINGS GOOD LEATHER.

From time to time, we see fine, handsome leather on the market or perhaps our salesman calls our attention to successful selling stock. The chances are that the hides were no better than ours, but the tanner probably was extremely particular in the handling of his young stock and unless the nursery of the tannery receives the most watchful care there will be disappointment and probably financial loss when mistreated leather is ready for sale.

LIQUORS IN EXTRACT TANNING.

About the liquors used in the layaways and handlers in yards using extract entirely or nearly so:

We use sour liquors altogether in our handlers. We put our hides from the beamhouse in very weak liquor, containing about one-half of 1 per cent of tannin. They remain there for from three to six days, after which the liquor is gradually strengthened until the pack is taken to the layaways. We feed the handlers continually and the worn-out liquors are run down the sewer and not pumped back on the leaches.

Let me impress the absolute necessity of having clean liquors. Tanks are the best for filtering, but in place of them vats will do. The tanks or vats should be connected with wooden pipe logs. Prepare

filters in two tanks and use the third tank for storage after the liquor has passed through the filters. If you have more than three tanks for filtering, all the better.

SOUR LIQUORS IN HANDLERS.

Use all sour liquors in the handlers, but when short, add some sweet liquor. This does not happen often. I know some tanners who employ half sweet and half sour liquor in the handlers and get handsome colored leather; all these liquors, however, were from ground bark. Sour liquor is what you want in extract tanning, as extract liquors will not sour like bark liquors.

Those who are not familiar with extract do not seem to think there is much difference between extract liquors and bark liquors. Bark liquors after being in the vacuum pan of the extract maker and turned into syrupy extract make liquor of harder nature than liquor of same strength from ordinary bark leaches. I have used half sour and half sweet liquors on first layer with good results. If it is found difficult to make handlers sour enough, add a small quantity of lactic or acetic acid.

MIXING EXTRACT LIQUORS.

In regard to mixing extract liquors. If you use liquid extract you should have a tub or vat used specially for receiving the extract. Run the extract into it, then add enough clear water to bring the mixture to the desired strength; some tanners prefer using weak tan liquors instead of water. If you are handling solid extract, a preparing or dissolving tank is necessary with a steam coil at the bottom. Chop up your extract, dump it in the tank and then cover with water. Now thoroughly dissolve with steam, so that the mixture will be in good shape when cool for pumping into the layaways.

SOLID QUEBRACHO EXTRACT POPULAR.

Solid quebracho extract is quite popular in tanneries, but it should be thoroughly dissolved, or material which is worth good money will settle at the bottom of the vat and then the quebracho salesman will be informed that it does not pay to use this valuable tanning agent. Tanners sometimes forget that inability to get good results from unfamiliar tanning materials does not necessarily imply that the fault lies in the material. Those who sell quebracho and other extracts are only too glad to tell customers how to use them to best advantage and their instructions should be carefully followed.

The best way to know whether your extract is thoroughly dissolved is to put your hand into the mixture and see if you can feel any grains. If it is grainy, the job is not being well done and the mixture should be heated until all grains disappear.

Extracts are steadily increasing in popularity and some tanners are using extract and no bark and thus they are able to do without a leach house, merely having a store house for the extract and quickly making tan liquor, of any strength, from it.

GOOD SCHEDULES FOR MAKING OAK SOLE.

Here is what we have used some time past in our tannery with good results in making oak sole leather:

SCHEDULE FOR THREE LAYERS.

First layer, 15 days, 25 degree liquor.
Second layer, 20 days, 30 degree liquor.
Third layer, 40 to 50 days, 40 to 45 degree liquor.

SCHEDULE FOR FOUR LAYERS.

First layer, 15 days, 25 degree liquor.
Second layer, 20 days, 30 degree liquor.
Third layer, 24 days, 34 degree liquor.
Fourth layer, 50 days, 40 degree liquor.

We have run much stronger liquor on layaways, but we find that this is unnecessary, as weaker liquors will give better results. Strong liquors appear to be employed to better advantage in drum or wheel tannage where the hides are kept in motion.

NECESSITY OF LARGE HANDLER VATS IN EXTRACT TANNING.

I called special attention to the importance of large enough handler vats so that the young leather would have fair opportunity at the start for beginning life in a straight condition, instead of being wrinkled and pinched for room.

Some tanners have objected to this statement because large handlers call for considerable liquor. I know that my suggestion will not be generally acceptable, from the simple fact that many tanners are unable to make the suggested change, although I still repeat that they are far more likely to get decent color when the handler vats are large enough to permit of free circulation of the liquors about the packs.

Certain it is that tanners altering or building, will find it a wise investment to make the tail handlers larger than the others. Already I can hear my brother tanners criticizing me for urging them to have a handler yard with vats of different sizes. I simply reply that those who persist in crowding the young stock in small tail handlers are probably troubled with stained leather and do not know how to avoid it. Every good tanner knows that desirable color on leather is very necessary. When a rich color is set the tanning can follow. I admit

the advantage of having the handler vats all the same size, but too much style has ruined many business men besides tanners.

ROOMY TAIL HANDLERS A PRIME NECESSITY.

I am told that modern tanners prefer uniform size in vats, but I still claim that big, roomy tail handlers are a prime necessity in every yard with an ambition for high reputation for leather. It is worth a good deal to be able to produce silky leather with the least trouble and expense. It is not always the finest looking plant that turns out the best quality of leather. Those who disagree with my views are respectfully asked to take a few sides and hang them in dirty slop liquor, clear of one another. Then crowd a vat full of sides in what you call clean slop liquor. Carefully note which comes out with the best color.

By coloring on my plan—plenty of room for the green stock—such labor as sticking, shifting and changing the position of the sides may be avoided. All this labor is required, however, when sides are jammed close together, otherwise there would be bad stains.

COST OF SHIFTING AND PADDLING AN ITEM.

Cost of shifting and paddling is quite an item in a large tannery. Say it takes two men three hours each day to shift 200 hides. At 10 cents per hour will be 60 cents per day, or $219 per year. And this is a low estimate. Even then, you are liable to get stained leather. If you are making scoured backs it will require an extra expense of 5 cents per hide, which is a low estimate. Five cents on 60,000 hides per year is exactly $3,000. So you see that there is a saving of $3,219 per year in tanneries producing 60,000 hides yearly if good clean liquors are used and plenty of room in the handlers. I have known this expense to run over $15,000 per year. Another thing, clean liquors and plenty of handler room do away with the need for bleaching the tanned leather and calls for only one-half of the scouring. Or it may be figured that clean leather requires only one-half to two-thirds of the scouring house work, when it is absolutely necessary that leather in light colors be produced.

CHEMISTRY OF THE HANDLERS.

Some tanners do not quite understand the chemistry of the handlers. I will try and explain it in a general manner. Take a test tube or glass bottle full of sour tan liquor, add a few drops of lime water; the liquor becomes cloudy, which disappears on shaking. Keep adding lime, and after a while the cloudiness remains permanent, or, in other words, you have dirty liquor. Let the glass stand and a sediment (tannate of lime) will appear in the bottom. This same action, on a

larger scale, is going on in the handler vats each day when stock is worked in, and explains why some sole leather tanners give the packs a light bating before removing from the beamhouse. When a green pack is put in the tail handler the acidity of the handler liquors at once acts on the limy grain of the hide, and a sort of thin scum emerges. This explains why dirty tan liquors should be pumped to the sewer after a while, and fresh sours given so that the lime in the hides will be rapidly neutralized, leaving the grain clean and of even color for the sweet liquors.

Now, it can be easily understood why it is vitally necessary for green sides or hides in the handlers to have plenty of room, so that the lime, when drawn or forced out of the grain has opportunity to drop to the bottom of the vat. On the contrary, if the young sides are pressed close together the tannate of lime is unable to escape, and this explains why dirty and cloudy grain results when the young packs do not get fair treatment. This also explains why it is necessary for constant changing and strengthening in the handlers, so that as fast as the lime from the packs neutralize the sour liquor the latter is replaced by strong sours, so that the work proceeds without interruption, until it is so well done that the pack is in prime condition to be sent to the sweet layaways and fine, handsome color may be relied upon when the leather is washed, dried, rolled and finished.

ROCKERS IMPROVE COLORING OF LEATHER.

I should add that where tanners have rockers for coloring their leather it is easier to get good color, but many tanneries nowadays do not have them. What I have principally referred to has been the pressure system of handlers where tan liquors are forced through the sides the whole length of the handler sours. Some tanners have five handler vats and some six vats to a section, and the liquors slowly circulate through the entire section. Consequently when they reach the tail vat the tan is about exhausted and worthless. In this connection the tannery chemist is an absolute necessity, as such liquors should be analyzed, as well as other liquors, so that tanners may know exactly what they contain.

SOUR LIQUORS PREFERRED.

Some tanners use sweet liquors on their handlers, but give me sours all the time. Sometimes I have been compelled to use sweet liquors in the handlers, but I never did so willingly. In my next paper I will tell how we feed our handlers with sour liquors, and how we keep the supply on hand for use.

Starting at the hide house, it is unnecessary to mention that the bundles of green-salted hides are opened out and weighed so as to

check invoices from the hide merchants. Every tannery has its own hide house rules and regulations, which also govern the management throughout the plant. Some tanneries are more successful in this direction than others, and those in which hides are put into packs in an intelligent manner are usually the most prosperous.

SMALL HIDES AND LARGE HIDES SHOULD BE KEPT SEPARATE.

It may seem a comparatively small point, but careful tanners put small hides and large hides in separate packs instead of working them in together indiscriminately. By arranging for hides of similar substance to be in one pack you can work them to better advantage all through the shop. In the first place, you will find in the beamhouse, provided you do your fleshing and working out by hand and pay by the piece, that you can arrange to give your men so much for small hides and more for the larger hides. If you do work by machinery in the beamhouse, it will not make so much difference in the cost of labor whether small or large hides are put through the machines. Let me say in passing that I believe there are few tanners in this country who do all their working out by machines. In fact, I do not know of any sole leather tanners doing so.

When your packs reach the layaways you will then reap the benefit of keeping large and small hides in separate packs. There you will find that you can save cost of tanning material and labor, besides making a saving in time. You can work the packs through the plant to advantage and you will find that the saving you effect in the layaways will many times pay for the time and trouble expended in sorting your hides before soaking.

SOAKING IMPORTANT.

Soaking is more important than is generally imagined. Much depends on the kind of water used, and it is not easy to advise how often the water should be changed. With spring or well water of low temperature you can soak with more safety and regularity than when river water is used, which is less easy to manage. Water is often responsible for damaged hides, and great vigilance is necessary when the water supply is not absolutely under the control of the tanner. The most important point in soaking hides for either bark or extract tannage is to do it thoroughly until all the dirt is entirely loosened, so that the hides will go through the limes in thoroughly clean condition.

NECESSITY OF CLEAN HIDES.

Never forget that the beamhouse is the nursery of the tannery and unless the hides are properly started in the beamhouse and made clean and kept so before going into the liquors that you will never

be successful in tanning with extract or any other material. I could give instances where unfortunate results have followed improper soaking and careless beam work.

Readers may think that the foregoing has nothing to do with tanning by extract, but it is of the greatest importance that hides be treated properly at the beginning, and that is why I have gone out of my way to call attention to this matter. I will further say that all tanners who have made a success of extract tanning have certain knowledge that they are slow to give to the public. This knowledge has only been acquired after patient and persistent watching and waiting, and is one of the rewards that follow devotion to work and a determined resolution to not be content with anything but the very best.

SYSTEM FOR SUCCESSFUL EXTRACT TANNING OF SOLE LEATHER.

The use of extract in vats for making sole leather requires careful watching, much more so than bark tanning. By carrying out the following system the finest kind of leather can be produced:

After putting hides through beamshop, hang them in handlers' liquors, 6 to 7 degrees on tail and 25 to 28 degrees on head. Take hides from head handler and lay away in 25-degree liquor. Put 1,000 pounds of bark to each pack of 100 hides; have 1,800 gallons of liquor in vat and put in 250 pounds quebracho extract, 200 pounds sugar, 2 gallons acetic acid. Leave hides in this layer for 12 days, then turn into 31-degree liquor; same amount of ground bark, 300 pounds quebracho extract, 150 pounds sugar and 1 gallon acetic acid, and let the hides lie for 18 days. Then turn into 36-degree liquor; 400 pounds quebracho extract, 800 pounds ground bark and 100 pounds myrabolans, ground and mixed with bark. Let the hides lie for 30 days, then turn into 45-degree liquor; 400 pounds quebracho extract, 800 pounds ground bark and 200 pounds myrabolans, ground and mixed as in third layer. Leave for 50 days. This gives 116 days in yard and 137 degrees of liquor.

CARE IN MIXING LIQUORS NECESSARY.

In bark tanning, most tanners claim the days and degrees of liquor should be equal. In this case I have found the finest results by carrying out the above plan. The most important part is in making up the liquors from the extract. The most diligent care should be taken in the mixing. When not thoroughly mixed, extract will settle to the bottom of vats and cause hard, dark spots to appear on the stock. I have known of tanners claiming the extract was no good when the fault lay with the tanners in mixing the liquors. Some tanners put

their extracts in storage tanks, and when ready for liquor pull plug and run the liquor into vat and drop in the leather. Sometimes they may plunge a little, or perhaps not at all. Either is wrong.

Run the extract into a vat connected with pump. Have a trough 12 by 12, with elevation enough for the liquor to run off as fast as the pump throws it into the trough, and let it run back in same vat. I keep this pump running all day, mixing extracts in that manner, and when I have my quebracho extract broken up I place it in the trough and let liquor dissolve it by running over it. By so doing I save steam. As I need liquors for my layers, I pump from this vat or vats into my receiving vat, and there I have air pipes in bottom. I mix my liquors to the desired degrees. All the time while liquors are coming from mixing vat into receiver I keep air pump going. Consequently my liquors are well mixed, and when I run down for laying away there is not a lump or any thick substance. I will admit it is lots of work, but it pays well to keep up this system.

SCOURING.

After leaving hides in the fourth layer for fifty days, draw for scouring room. Wash the leather well in yard in sour liquor and let drain for two hours before scouring. The best machine in my experience is the Fitzhenry for scouring backs or bellies. One man can scour 250 backs a day; and 400 bellies is a good day's work. Scour flesh and grain. After scouring, bleach in sal soda and sulphuric acid solutions. I oil in a wheel, using one-half pound cod and one-fourth pound mineral oils mixed to each back.

DIP IN SUGAR.

After oiling and drying, make a 10 per cent solution of sugar and dip leather in it, letting remain in solution about one minute. Then hang up and dry again before dipping for rollers. This will improve the color, besides giving weight. After stock is well dry, take down and dip in clear, cold water and stay down for twenty-four hours. Then roll. If stock is wanted very hard, second-roll right after first rolling and hang in hot room over night to dry, say, temperature of 105 degrees Fahrenheit.

FINISHING.

When ready for shipping, just before loading in car, run through polishing machine. Use wax on brushes to give a nice gloss. This method is the finest process I have tried for extract vat tanning of sole leather. There is no need for a leach house or the old style round leaches. I take eight or ten vats in yard and equip with steam and air for leaching the bark after it has been used once for layaway. This

liquor I use for reducing my extract down to the proper degrees for laying away leather in. The first layer is made from liquor of the fourth layer. The first, second and third layer liquor I use to keep up handlers. The stock in the handlers should be handled a sufficient number of times each day so as to eradicate all spots. Leather will show spots much quicker from extract than from bark, as bark does not color nearly so fast as extract. This stock will have a good fiber, fine color and splendid solidity, and outwear bark-tanned leather.

CHESTNUT AND QUEBRACHO A FINE TANNAGE.

I have used all the extracts and I find chestnut extract and quebracho make a fine tannage when combined. Also myrabolans ground and mixed with the bark is a great factor in making acids and color. The extract manufacturers cannot be given too much praise for the scientific manner in which they assist the tanner in reducing the time of making leather and the cost of handling bark, etc.

QUEBRACHO IN COMBINATION WITH OTHER TANNAGES.

The tanner of heavy leather—sole, harness and belting—who is not familiar with the use of quebracho would do well to investigate this tanning material. The advantages of using quebracho are numerous, and the extract is growing in favor. When quebracho extract is used in combination with a bark tannage in the tanning of sole leather it gives more mellowness than the straight bark tannage. Harness leather is made more than usually tough and strong, and the same is true of belting leather.

QUEBRACHO EXTRACT MAKES PLIABLE LEATHER.

Quebracho extract makes leather of great pliability. It is used by some tanners as a fore tannage on upper leather, and also in combination with hemlock. Combined with hemlock it produces leather of unusual pliability, toughness, good color, weight and fullness. It is also useful in the retanning of splits and in the tanning of any kind of patent or enameled leather.

The color of quebracho tanned leather is similar to oak tanned stock. Owing to its turning red upon exposure to strong light, quebracho tanned leather should never be dried in the sun.

TANNER MUST UNDERSTAND ALL DETAILS.

Before a tanner can make a success of using quebracho extract he must understand all the details connected with it. These details are, first, that the solid extract must be dissolved carefully and in such a

manner that the precipitation that takes place should go on in the vessel in which the extract is dissolved and cooled instead of upon the leather. The solid extract should be boiled up in a tub having a false screen bottom. This prevents the extract adhering to a solid surface. Liquid extract should be dissolved in water standing at 180 degrees. The extract liquor should never be run into the vat liquors until it has become cool. It is a great mistake to suddenly chill the extract liquor. Any sediment remaining in the tub may be worked up with fresh water on a tail leach or elsewhere.

Another important point to be taken into consideration in determining the strength of a quebracho liquor is that the barkometer underrates the tanning strength of such a liquor. Quebracho extract is of very concentrated tanning strength. A liquor made up of quebracho extract and water at 20 degrees barkometer is fully as strong in tan as a sweet bark liquor of 30 degrees bark. Unless this variation is taken into consideration the quebracho liquor is used too strong and the fibers of the leather are injured.

QUEBRACHO NOT A GOOD PLUMPER.

Some tan liquors make leather firm and hard, but quebracho being a sweet tan tends to make the leather pliable instead of hard, and, owing to its sweetness, quebracho is not a good plumper, and the hides must be well plumped before they are put into quebracho liquors. They must also be well bated and free of all lime. Bark liquors act as a bate, but a sweet quebracho liquor does not, and coming into contact with lime in the hide fiber produces bad grain and color. Leather liable to crack and not properly filled results when hides are not plumped before being put into quebracho liquor. One way in which quebracho extract is useful is in controlling the acids in tan yards that have a tendency to turn sour. On the other hand, when the extract is used, with other tans that turn sour, too much quebracho must not be used, as it sweetens up the liquors too much. A little divi-divi added to a quebracho liquor improves the color of the leather.

QUEBRACHO COMBINED WITH HEMLOCK PRODUCES GOOD LIGHT LEATHER.

But the use of quebracho is not confined to heavy leathers. Light leathers of good texture and color are made with it, especially when it is combined with some other tannage, such as hemlock. Hemlock tanned leather for both harness and shoe purposes is benefited by being retanned with palmetto extract, used in the same way that gambier is used as a retannage. It works well in pin mill drums, and it not only improves the character of the leather but helps it to carry the black well and to hold the grease. From the hemlock liquors the hides are split and then are given the palmetto.

HYDROMETERS, BARK LIQUORS AND PROTECTION OF VACUUM PANS.

A little questioning among the generality of extract manufacturers will disclose a lack of knowledge of the hydrometer used in the different departments of the extract factory, writes an experienced extract man.

I was familiar with much of the workings of an extract plant before having an opportunity to get the facts in regard to the specific gravity of the tan liquors and the density of extract in process of extraction, as well as the finished product; hence in giving below some facts in regard to hydrometers we feel that the data will prove of interest over a wide territory.

UNIT OF COMPARISON.

The specific gravity of all liquids is referred to distilled water as a standard, the unit of comparison being 1,000 grains of distilled water at a temperature of 60 degrees Fahrenheit. For example, an equal bulk of oil of vitriol (C. P.) at the same temperature will be found to weigh 1,845 grains, the specific gravity of oil of vitriol being expressed by the figures 1,845. The inconvenience of measuring and weighing like bulks of liquids led to the construction of the hydrometer, its principle of operation being that of the law of floating bodies—i. e., that when a body floats the weight of the bulk of liquid displaced is equal to the weight of the body floated.

The confusion caused by the use of four figures in denoting specific gravities has led to the substitution of various arbitrary scales in the making of hydrometers, thereby greatly simplifying it as an instrument for practical use. Many of the scales have been devised for a specific use, as Carter's, and Gay Lussac's for spirits; Long's and Southworth's for beer.

TWADDLE'S SCALE UNIVERSAL.

The scale universally used by the extract manufacturers in this country is Twaddle's. Of this scale there are two kinds; one graduated from 0 to 70 degrees for liquids heavier than water, and the other from 10 to 100 degrees for liquids lighter than water. The hydrometer, or Twaddle, as it is familiarly called in the extract works, is constructed by preparing a solution of salt containing 15 parts of salt by weight and 85 parts of water by weight, making the scale at the point to which it sank in pure water 0, and in the 15-degree salt solution 15, dividing the space between 0 and 15 into equal parts and continuing the scale above 15 in the same manner. The hydrometer for liquids lighter than water is, of course, never used in the extract factory, but is made by using a 10 per cent solution of salt prepared in

the same way, fixing 0 as the point to which the hydrometer sinks and making distilled water the 10 point, a scale is obtained as in the other instrument but running in an opposite direction.

Twaddle's scale is converted to specific gravity by multiplying its degrees by 5 and adding 1,000 (water)—i. e., 42-degree extract equals 1.210, or, better still, 1.21, dropping the cipher.

THE BARKOMETER.

The hydrometer used in determining the specific gravity of tan liquor is better known as a "Barkometer," and 5 degrees on this instrument equal 1 degree on Twaddle's scale. For example, tan liquor showing 10 degrees on the barkometer will show only 2 degrees on Twaddle's scale. Six degrees of heat equal 1 degree on the barkometer, while 20 degrees of heat equal 1 degree on the Twaddle. Another interesting fact in this connection is that of barkometer degrees corresponding to the second and third decimals of specific gravity. For example, tan liquor having a specific gravity of 1.065 equals 65 degrees barkometer strength.

A consideration of great importance to extract makers, and one not fully appreciated by many of the smaller concerns, is that of the radiation of heat from the vacuum pan, or multiple effect system of evaporation, as the case may be. One of the strange sights I have noticed in visiting extract plants is that of finding all the steam pipe well covered with sectional pipe covering to prevent the radiation of heat but pan or evaporators without any protection whatever.

COVER PANS WITH ASBESTOS CEMENT.

A very material saving in fuel will be effected if the pans are covered with asbestos cement at least one inch thick; one and a half inch coating is preferable. One sack of the asbestos cement will cover forty square feet of pan surface and will cost about $1.80 per sack. From this it will be seen readily that the cost is insignificant when compared with the saving effected. The pans should be in operation when the cement is applied. First whitewash the pan with a solution containing glue and asbestos, then apply the cement with a consistency of mortar until the coating is a half-inch thick, the pan being hot and the cement readily adheres to the surface of the pan. Now the pan should be covered with chicken fence wire, after which the cement is applied and made as thick as desired.

THE USE OF EXTRACTS.

The following article is from the pen of an experienced extract man and shows the attitude of many tanners regarding the use of extracts:

The way to use extract is to use extract.

The trouble with the great majority of tanners whom we visit is they wish to start in too small a way to show results.

I called on a tanner the other day, and he said, "Extract is no good. I tried it last year and I could not see that a barrel of it raised a vat of liquor more than a couple of degrees."

"How much did you try?" I asked. "Ten barrels," he replied.

"And a barrel only raised a vat a couple of degrees? What did you expect it was going to raise it—30 degrees?"

Another tanner says: "I had a car of your extract and I did not see that it helped my yard at all." He was making 200 sides of harness leather a day; a yard all run down, sapped out, in the spring of the year, and expected one car of extract was going to reform it. Great Scott!

A big sole leather tanner said: "You may send me ten barrels of your extract. I will try it." I replied: "Excuse me. We can't send you that amount. You won't be able to do yourself any good with it and you might fix matters so that we will not be able to sell you after you learn how. If you will take ten cars and use it with as much judgment as you show in conducting your tannery with bark, we will guarantee you results."

The trouble with our tanners is, they expect results to show from the use of too small quantities, and from the *spasmodic use* at that. The effect of a car of extract, or five cars, for that matter, on an average-sized American yard is scarcely noticeable.

My suggestion to tanners who find their supply of bark running short is to buy extract, use a reasonable amount; use enough so it will manifest itself in your leather. Charge the extract into your tanning material account, and at the end of six months or a year, preferably the latter, figure what it has cost per pound for tanning material in your leather as compared with bark. You will be surprised how cheaply you have tanned, how near to the days when there was plenty of good old hemlock bark. It is absolutely useless to try and figure from day to day, week to week, or month to month, *particularly so on the start.*

Our friends the tanners will "stand" for almost any kind of a loss in the tannery and "cross it off" with a few cuss words and, "that's the chances we take in the business." They see thousands of sides go out with the gain 10 per cent below where it should be, or the sides harsh and cracky, just because the liquors got too sour or were too sweet, but when it comes to making a loss of at best, a few hundred dollars, through the purchase and trial of a few cars of extract, they get their pencils out and immediately begin to figure. They must see exactly how and when they are to have returns.

The first question is, How much is your extract per pound? How many pounds in a barrel? How many cords of bark is a barrel equal

to? A short mental calculation. "Oh, no; we can't use the extract; we can buy bark cheaper. You extract fellows must be getting rich."

"How can so-and-so (neighbors) make any money? They are paying 14 cents for Texas packer hides and $11.50 for bark. By G—d, I don't see how they can get a new dollar for an old one. We are shut down; we won't pay any such price for hides. Good-day, call again when you are up this way." This is how some tanners talk.

The next time we were up that way our friends were in the hands of the sheriff and Mr. So-and-So was still using 14-cent packer or higher hides and $11.50 bark, and *a good big percentage of extract.* I have no doubt whatever that with bark at $11.50 their average cost of tanning material in their leather was reasonable. The high-priced bark was comparatively a small item. They simply used enough to free their liquors from the non-tannin and purify them, depending almost entirely on the tannin in their extracts to fill and tan their leather.

METHODS OF SAMPLING EXTRACTS.

In these days of close competition there are very few successful tanners who do not require the services of a good analytical chemist, either for determining the value of raw material when purchased on a guaranteed basis, or for establishing and maintaining scientific control throughout the different stages of manufacture. Most of the large tanners have laboratories and employ chemists whose training has made them competent to properly take samples. Aside from these there are quite a number who have not enough work to warrant them in permanently retaining a chemist; consequently they patronize the public analyst, intrusting the sampling to the tannery superintendent or foreman, and it is with a view of reaching these that this article is written.

The importance of obtaining representative samples cannot be overemphasized, for many discrepancies and seeming inaccuracies in the results of different chemists are largely due to carelessness in sampling, and furthermore, the analysis of any substance that is not indicative of the bulk is more than worthless, and often the cause of disputes and disagreements.

No infallible rule can be given for sampling in all cases, but by using some judgment and following the lines below it will be impossible to go very far astray.

LIQUID EXTRACTS.

Among tanners it is now more the rule than the exception to use extract, most of which is bought on a standard of tannin, and the chemist's analysis accepted as a medium of settlement. To obtain a

fair sample the principal requirement is to get the "reds," insolubles and heavier extract, completely mixed, which is usually accomplished, when the extract is in barrels or casks, by thoroughly shaking, then remove the bung and draw sample with a one-inch brass tube about four feet long and open at both ends. Slowly insert tube into the extract, tightly cover the upper end with hand and run the extract into clean, dry pail. Proceed as above until at least 20 per cent of the casks are tested, for frequently the extract in the same shipment varies, caused by being taken from the vacuum pan in "strikes," which do not always run of a uniform density. When the extract is received in tank cars the mixing is done by plunging through the manhole in the dome, using an ordinary wooden plunger. Draw at least a pail full, using the brass tube in the manner described. This method gives a more exact sample than catching it as the extract is being run from the car. After well stirring the extract in pail, take about eight ounces for chemist's sample, put into dry jar or bottle and seal, leaving enough space to allow extract to be shaken.

SOLID AND PASTY EXTRACTS.

It is much more difficult to draw a sample of pasty extracts on account of the impossibility of mixing. The most successful way is to plunge a brass tube, sharpened at one end, through the thick extract until it penetrates to the bottom of cask; withdraw and press extract out of tube with a plunger rod into a pail. Sample at least 15 per cent of whole, then quickly mix contents of pail with hand and put about one-half pound into airtight jar. After much experimenting with methods for sampling solid extracts the most satisfactory results were obtained by using a sampler similar in construction to a large belt punch. This is one and one-quarter inches in diameter and a foot in length. Drive entirely through the bag or block in five places, shaking extract out of tool each time by gently tapping with hammer; collect in box, mix, take sample and keep well sealed. Solid extracts that are received in small pieces or cubes are best sampled by spreading out, selecting handfuls from different parts, using judgment as to what constitutes an average sample. In all solid extracts about 10 per cent of total bags or casks should be sampled.

BARKS, WOOD AND TANNING MATERIALS.

Most samples of unleached bark are submitted to the chemist after grinding, which makes it impossible for him to get the proportional amount of ross and fiber as was originally in the new bark. This can be avoided by sawing cross sections of bark from various parts of the sheet, or by breaking small pieces from enough to secure an average sample. This is also a good way to sample wood, although not necessary, as an equally good sample of wood can be obtained after grind-

ing. When ground or pulverized tanning materials are to be sampled better results are to be had by running tube through the bags, but where this is impracticable sample can be taken with the hands from different parts of bag, sampling 10 per cent.

SPENT TANNING MATERIAL.

Less attention is given to the choosing of spent tan samples than any other material around the tannery, while it is by far the most important, especially where large quantities of bark are used. In most of the leaching systems the solvent is run on the bark from the top; therefore the top bark is better leached and contains less tannin than the bottom. Consequently to secure a representative sample it is necessary to take from top, center and bottom while casting the leach. After about a foot is cleaned from the top a sample should be taken from different places, put into a covered box, to prevent any dust from new bark getting into it. Likewise take from the center and bottom. Where a leach casting machine is used the sample can be easily taken from the pitch hole each time the arm reaches the above levels, then mix and spread about a pound in a clean pan to dry, after which send to chemist.

LIQUORS.

New liquors should be thoroughly plunged in the coolers before taking sample; more satisfactory results if taken after liquor has cooled. This should also be taken with a brass pipe and about a pail drawn, carefully weighed with barkometer, retaining about a quart for analysis. Sapped or sour liquor should be taken in the same manner from vat just after lifting the pack. Handler liquor should be taken from as near the overflow plug as possible, without plunging. Always weigh all samples and compare with chemist's report.

WATER.

The importance attached to the water used in the many stages of tanning cannot be overestimated, and every tanner should be familiar with the water he uses. If the supply is obtained from a stream or river it should be taken from as near the intake pipe as possible; if taken from the city mains or a deep well, draw from tap after water has been running for some time. A new earthenware gallon jug is rinsed with hot water, then with the water to be analyzed, after which it is completely filled, emptied and then filled to within an inch from the top. Cork with new cork, which should be tied or sealed in place, tag and express to chemist without boxing.

OILS AND GREASE.

The main requisite in sampling oils is to mix well, which is done by shaking the barrels, or, when in tanks, by plunging. Cod oil

should be unusually well mixed, as frequently "foots" settle out, in which case an aliquot portion should be included in sample. Brass tube used. Tallow and hard grease should be sampled with the regular tallow tester, and care taken to reach the bottom of the barrels, as most of the dirt and impurities are found there after cooling. Jar or bottle in which sample is put should be free from moisture, as the smallest amount often clouds clear oil. Ten per cent of whole should be sampled.

ACIDS.

Acids, if in carboys, barrels or tanks, should be well mixed before sample is taken. Draw with glass tube and quickly put in airtight receptacle.

SALTS AND CHEMICALS.

Soda, borax, salts, etc., can all be sampled with tubes unless received in large crystals or lumps, when it is necessary to break small pieces from lumps and quickly seal. Ten per cent of bags or casks being sampled. This also applies to lime.

In conclusion, might add that the essentials in sampling any materials are: Always have everything used in sampling clean and dry; keep the substance from being exposed to any abnormal conditions and conscientiously obtain representative samples.

TANNING WITH CHESTNUT EXTRACT.

INDUSTRIAL CONDITIONS.

Among American tanners chestnut extract has seen its greatest development during the past ten years, and of this period perhaps the two years just gone have shown the universal application of it. Various industrial conditions have affected the tanner's demand for a wider range of tanning materials than was supplied, up to a few years ago, by the hemlock forests of the North and the oak forests of the South. The development by the leather industry towards larger output has been accompanied by a travel in the opposite direction by the hemlock and oak supplies. Incident to such conditions the prices at which hemlock and oak have been available in various localities have advanced with a positiveness not to be mistaken. Exhaustion, at least to the extent of supplies not keeping pace with increased need, is apparent in all the localities in which the two common materials were formerly abundant. The extent to which competition among very large consumers has affected the conditions of supply has been greater in some localities than others, but in all sections enhanced prices, and the general difficulties of securing bark stocks, have been obvious. All materials, without exception, which enter

into the manufacture of leather, have shown similar enhancement of price, and it is a fact, concealment of which is nowhere attempted, that the general margin of profit in tanning leather has been much contracted, and in some lines wholly absorbed.

INCREASED SUPPLY OF EXTRACT.

This brief statement of the conditions affecting the leather industry in the recent past will disclose the general industrial reason for the rapid adoption of other tanning materials than the barks heretofore familiar as the bases of leather. Cheapness and availability have characterized these new tanning materials, and the hesitant conservatism of the leather trade has been broken down by the stress of necessity. When it had been demonstrated that chestnut extract could be made the base of a leather satisfactory in every essential, the other conditions surrounding the industry were such as to force its adoption. Tanner after tanner took up the subject, more or less unwillingly, but in every case inevitably, and the demand for the material soon developed far beyond the ability of the extract trade to supply. The response from the extract trade was prompt—factories were multiplied and the area of prime chestnut stumpage soon brought under control. The production was quadrupled within a few years—and yet the demand increased at a faster pace, presenting the rare industrial spectacle of a new material holding its price level in the face of a production which doubled each year.

That the necessity for this new material was primary and deep-rooted was shown by the general quest for bark substitutes—South American and African barks, foreign extracts of various sorts, and a stimulation of the search for a chemical tannage which might displace the vegetable. Stranger still, all these materials satisfy only a part of a demand which has but one future condition—continuous further increase. And to make the chapter complete to date, it should be stated that the area of prime chestnut stumpage is now well under control, and it is doubtful whether the proper raw material foundation exists for further extension of the industry in any material or determining degree. The available sites for new plants of proper modern capacity could perhaps be counted on the ten fingers, with some fingers to spare. Furthermore, developments of the near future will place the extract business on a very much higher investment basis—the small factory will be eliminated, and in its place will come the larger plant, with its paper mill, railroads, large area of stumpage systematically reforested, private distributing cars, and other expensive, high-class equipment. The use of the large, instead of the small, unit of production, will become imperative. A comprehensive view, which takes into consideration the natural forces impelling the extract business, must foresee, not intense competition and low price levels, but

an intelligent adoption of the large plan as being more efficient than the small plan.

The current situation, using broad factors, may be thus summarized:

First: The demand for chestnut extract is basic—its use is enforced by conditions.

Second: The present supply cannot be multiplied very much further.

Third: The future supply, without regard to volume, will be safeguarded by the continuous increase in manufacturing efficiency.

Fourth: The material has bright future promise—it may be depended upon during many years to come, owing to the rapid growth of its raw material.

Fifth: A proper view, from the tannery standpoint, is that the material must be given a definite, permanent standing in the tannery, and its future supply intelligently provided for.

METHODS OF USE.

In the degree that tanneries differ in their processes, so it is found that the various current methods of using chestnut extract differ considerably in plan and detail. The leathers upon which the extract is applied embrace practically the entire range of tannages—upper, patent, enamel, tipping, counter, insole, lace and sole in the shoe category; bag, trunk, strap, harness, collar, net and bicycle in the colored split and side leather group; patent, enamel, grained and boarded goods in the furniture, carriage and upholstery lines; the fancy group, including pocketbook, band, bookbinding, etc.; and the heavy stocks, such as belting. All these, and others, use heavily of chestnut extract, alone and in admixture with other materials.

PRIMARY PURPOSE OF TANNING MATERIAL.

In these various lines the primary purpose of the tanning material is to effect the combinations of the hide and tannin—the character of the product is determined by the manipulation which the stock and tanning material receive before, during and after the tanning process. Treating the subject in a general way is difficult; and it is neither possible nor desirable that effort should be made to show the multitude of details which are involved in the actual practice in the several lines. The general principles involved in the individual lines, arranged in groups, may be readily pointed out; and to do this it is well to first formulate the general prnciples involved in all tannages of the vegetable sort.

Without consideration of the preliminary operations involved in clearing the hide of flesh, hair, grease, etc., all hide is at first sent to the tanning liquors as simply wet hide fabric. In this state the af-

finity of hide for tannin is at its highest point—absorption of the tannin is rapid, decreasing in rate as the exteriors become tannin-saturated. The general principle covering this feature of all leathers is that, given the hide in the condition proper for the product in view, the absorption of the tannin shall proceed with as much expedition and in such quantity as the intended product requires. A companion principle involved at this point is that the liquors shall have the property of maintaining the hide fabric in the condition in which it is brought to the liquors, or that they shall bring the stock to a specially sought condition. In nearly all leathers it is essential during tanning that the hide shall either be swelled by the liquors—slightly in some, drastically in other cases—or maintained in the distended condition brought about in a prior operation.

RELATION OF GENERAL PRINCIPLES TO CHESTNUT EXTRACT.

The relation of these general principles to chestnut extract lies in the different performances of diverse tanning materials under the same conditions of application. Some tanning materials, for example, contribute little or nothing to the power of the liquor to swell the hide, or to maintain it in a distended condition while tanning is proceeding. Then, again, the rate at which hide will combine with various tanning materials is widely different, both as to rapidity and quantity. It is obvious, therefore, that tanning material which will contribute in suitable measure to all the desired liquor properties, and at the same time possess a tannin which the hide will take up rapidly, in large quantity, and with a resultant stock satisfactory in quality, will possess exceptional value over a wide range of applications.

Splitting the general run of leathers into classes, based on weight, will give a fair plan of stating the general principles covering each group.

First: Calf, sheep, goat, etc.
Second: Light hides for side leathers.
Third: Light hides for split leathers.
Fourth: Heavy hides for flexible stock.
Fifth: Heavy hides for firm stock.

CALF, SHEEP, GOAT, ETC.

Such of these skins as are tanned by vegetable tans are really skins, as distinguished from hides of greater spread, weight and coarseness. Leather in this class is sold almost universally on area bases, and this factor determines pretty much the general principles of the tanning methods followed. Ignoring the preliminary operations of dehairing, etc., the goods are generally wheel of drum-tanned, without regard to plumping action except on goods requiring a considerable measure of thickness. Generally the drenched skin is wheeled

or drummed in the liquor made direct from the extract or other tanning material, or a mixture. Stock destined to be colored subsequent to tanning is usually tanned direct in the extract liquor, with occasionally a retan in sumac. Stock to be run in the natural color is usually struck in the mixture giving the shade desired. With these very thin leathers the main requirement of the tanning material is that it shall be clean, bright and quick in action.

LIGHT HIDES FOR SIDE LEATHERS.

Under this class we encounter plump stock, or that in which the hide is distended either before or during the tanning. In this group, for purposes of illustration, may be put bag, trunk, certain grades of harness, etc., all being leathers of medium thickness and pliability.

In the tanning of these stocks the general practice is to put the white stock first through a series of sour liquors, in which the hide fiber is measurably plumped. These liquors are made originally by direct solution of the extract in water or freshly made bark liquor; so prepared, the liquors are given sweet to the nearly struck goods, usually as layaways, not infrequently in wheels or drums. Fermentation develops the mild acidity essential in the sour end of the yard, and here these liquors systematically gravitate. These stocks are always tanned out in liquors relatively weak—rarely exceeding 15 degrees barkometer as freshly prepared. As pliability and moderate strength are essential, the plumpness of the hide is carefully controlled, and the stock's progress from the weak liquors of the sour end to the stronger liquors of the drums or layaways is made in easy steps of considerable time length. Chestnut extract on these leathers provides in itself abundant souring material for the mild acid liquors employed, and owing to the high purity of the extract the progress of the tanning is uniform over all parts of the hide. Not infrequently where these stocks require a particular color quality they are retanned in suitable material—mimosa, palmetto, gambier, quebracho, etc.—depending upon the shade or color condition sought.

LIGHT HIDES FOR SPLITS.

This large group embraces the widely diversified leathers derived from splits taken off plump stock during tanning or afterwards. In this field are patent and enamel goods for various lines—shoe patent and enamel, carriage, furniture, bookbinding of some types, etc.—and natural color splits of different sorts and applications. Generally throughout this group the characteristics are uniformity of plumpness in order that the splits may be uniform in fiber condition, rather high tensile strength and high elasticity of fiber. In the patent types the tanning is carried to completion before finishing, in order that the

fiber may have minimum expansion and contraction under weather conditions. In the enamel lines the tannage is likewise complete, the effort being to secure porosity without looseness of fiber. In this entire group the liquors are run with the view of securing as much plumpness before splitting as the stock will bear and still yield good quality. Rather greater acidity is used in the sour end of the yard than for the group embracing side leathers, and the stock is generally run longer in the sours. The splits are taken off variously, sometimes when the stock has reached its desired plumpness, but before it has been struck positively, sometimes after the fibers have been finally fixed; occasionally a split, generally the grain, is taken off out of the sours, the remaining splits later.

CHESTNUT EXTRACT HAS ATTRACTIVE QUALITIES.

Chestnut extract in this group presents many attractive qualities, the particular points of excellence being sufficient souring quality for the sours, efficient penetration in the layers and drums. The liquors are generally worked systematically, the freshly made liquor being of pure extract or a mixture—generally the latter, a combination of bark liquor, chestnut and quebracho—and given to the stock as head layers or drum liquors for the splits. Worked down the yard the old layers and drum liquors become properly sour for the gradual plumping action employed. These stocks are nearly altogether foot leathers and sorted in ounces per square foot; they involve, exactly in proportion to the greater plumpness employed, more tanning material and more of the actual process of hide-tannin combination than any group so far treated.

HEAVY HIDES FOR FLEXIBLE STOCK.

This group is also large and important and should, perhaps, be subdivided into two classes—thin and plump, the former covering harness and the latter belting, as type products. The general tanning methods on the two classes are much alike, the difference being largely manipulative. Both stocks are generally pound leathers and both are curried, or stuffed, before application. The prime consideration with both is strength with body or plumpness. Hence the generally painstaking beamhouse work common to these stocks. The liquor practice involves a relatively long series of sours, longer with the plumper goods, and the layers are run on a higher schedule of strength than with any stock so far treated. In the handlers of the harness yard the stock is brought to its plumpness gradually, in order that the fibers may be tough and pliable. The sours are run less acid than those in the butt yard, but they are kept well up in tannin, in order that the striking may be constant and the possibility of falling eliminated.

IN THE BUTT YARD

the handlers are generally longer in series and richer in acid and tannin. The gradual distension of fiber proceeds while the surfaces are tanning, the stock being brought to its desired plumpness before it has finished its course through the handlers. The subsequent two or three layers are generally made up of old layers, containing sufficient acid to maintain the plumpness acquired in the sours, and in such mildly acid layers the stock begins the work of tannin absorption in greatest measure. The time spent in these layers varies in different yards, but the guilding rule is to keep the stock feeding, yard foremen of the best type governing the travel of the stock by its condition without close regard to a fixed time schedule. With the stock well colored through it is past the point at which the fibers may fall, and the sweet layers are begun, the strength and duration of which vary in different yards.

IN THE HARNESS YARD

the strength of the head layers is much less than in the butt yard; in the former the effort is usually towards a complete tanning of the fiber without materially filling the intercellular spaces, the latter being wanted for reception of grease in the subsequent operation of currying; in the butt yard the final layers are run on a higher schedule of strength, in order that the stock may be firm before stuffing in the belt shop.

CHESTNUT EXTRACTS PRODUCE VERY DESIRABLE EFFECTS.

On these stocks chestnut extract has particularly desirable effects, and is generally employed in connection with bark. As in both harness and butt yards, the plumpness of the stock is brought about by the natural sour resulting from fermentation of the non-tannins, the bark contributes what is wanted in the way of fermentable matter, while the chestnut furnishes a tannin rapid and thorough in penetration. Furthermore, in the layers of these yards, the feeding of the stock on mixed bark-chestnut liquors is more positive, more uniform and more satisfactory in the flanks and shoulders than with bark liquors alone. It is also stated that grains are better on the mixed than on the straight tannage and the general character of both leathers is much improved.

HEAVY HIDES FOR PLUMP STOCK.

This class may be typified by sole leather—hides of large spread, coarseness of fiber and maximum natural thickness. The prime requisites in sole stock are that it shall be plump, firm and tough as regards abrasion. Roughly, sole leather is in two divisions—peg

goods and sewing goods, the former being exceptionally hard and stiff, and the latter mellow, more pliable and with a fiber soft to the thread. This division holds in hemlock, oak and union—more in the first, less in the second and still less in the third—and influences the tanning method, and measurably the tanning material, employed.

IN HEMLOCK SOLE YARDS

the plumpness of the stock is produced by two methods—an artificial acid liquor and a liquor soured by the natural fermentation of the non-tannins, the latter being the method in use in oak and union yards. Where artificial acidity is employed the stock is usually colored out of the beamhouse and then plumped in a vitriol liquor to the desired condition. It is then carried through a succession of sour liquors, the object being to support the hide fiber in its distended condition while the grain is being thoroughly struck and the opaque acid streak changed to a more open texture. From the sours the stock is taken through sweet layers, progressively stronger and longer in duration. In these layers tanning and filling are accomplished, and as the stock tans further in from the surfaces the greater the need for high penetration by the tannin. In these yards the chestnut extract is dissolved in the bark liquors which are to make up the layers, furnishing a mixed liquor of strong penetrating power and yielding abundant souring qualities when worked down the yard to the handlers. High percentages of extract are employed, the issuing stock being of a somewhat modified color, but advantageously, from the usual red of the hemlock; in wearing quality, markedly superior to the pure hemlock tannage.

IN THE ACID YARDS—

hemlock and oak—the procedure as given for belting butts is largely followed, except in measure of plumpness and completeness of filling. On sole leather the liquor practice is tending towards exceptionally strong liquors in the upper layers, and often a drumming in liquors too strong to give as layers, the object being to force the combination of hide and tannin to its limit, while filling the intercellular spaces. Stock so tanned is generally given very drastic finishing treatment—scrub, sour and repeated mild bleaches, before sending to loft, in order that the surfaces may be cleaned and cleared of uncombined coloring matter which dries imperfectly. In these yards chestnut extract, through its high penetration and tanning power, gives excellent results mixed with the bark liquor, besides facilitating control of the acidity which so often gets the upper hand in straight bark practice. That grains are better and flanks, shoulders and bellies markedly improved, is the general experience with the mixed tannage.

GENERAL.

Where chestnut extract is used in conjunction with bark, hemlock or oak, it may be taken as the first principle that its proper place is in the layaway liquors. Properly dissolved in the hot bark liquor and cooled the extract gives no indication of its presence in the yard except in faster and fuller tanning of the stock and in control of the acidity at the lower end of the yard. This holds in practically all applications of the material. Importance is laid upon the penetrating power of chestnut tannin, particularly at that stage of the tanning of plump leathers where it is necessary to strike the plumped fiber promptly after the sour liquors have brought it to the desired state. The looser parts of the hide—flanks, shoulders, bellies—are much inclined to fall, or deplump, unless they are promptly fixed by the tannin, and the general experience that these parts are better in the mixed tannage is due to the prompt penetrative action of the chestnut tannin. Whereas in straight bark practice it is essential that the handlers should be run very sour to support the plumped fiber during the slow penetration of the bark tannin, in the mixed tannage the presence of the chestnut tannin, with its higher penetration, decreases the acidity necessary. Understanding these points gives explanation of the better stock incident to chestnut admixture.

As a proper part of the present purpose it is well to say that the term "Chestnut Extract" is elastic. There are many different products available to the consumer under this designation, some prepared with proper scientific methods looking to all the various factors of tannin content, purity, penetration, solubility, etc. Others are not so circumspectly prepared and offer on the consumer's stock effects as various as the points from which the various extracts may be derived. The importance, from the tannery standpoint, of perfect uniformity in the extract the year round, that no disturbing element may be introduced into the tanner's routine (already sufficiently complex) is a feature demanding vigilant attention on the part of the extract producer. That the goods shall be based upon high-class raw material, leached with a water as pure as possible, and given every care in the factory at the various stages of manufacture, are things upon which the consumer, after he discovers that "extract is extract" is fallacious doctrine, should insist.

Bark and Chrome Belting.

CHROME TANNED BELTING.

Many substitutes for leather belting have been made, such as combinations of India rubber, hemp, flax, cotton, etc. Some of these do not stretch, some will stand moisture, heat and cold, but they nearly all have some drawbacks. India rubber soon blisters, and the outside covering wears rapidly off, leaving the inner surface exposed, which soon goes to pieces. The cotton belt as soon as the outside edge is worn away unravels, making it almost impossible to repair it. These substitutes for leather belting, although the first cost is less than the first cost of leather, are much dearer in the end. Experience has proved that for all machines leather belting is the thing, but that the old methods of beamhouse work and tannage were not what they should be.

CHEMICALS IN SOAKS AND LIMES.

After much experimenting it has been found that the hide fibers may be held intact in the beamhouse by the use of chemicals in the soaks and limes, and the hides need no longer be reduced in a bacterial drench for killing the lime. In tanning it has been found that the chrome process imparts strength to the fiber. To kill lime and to preserve the gelatine contained in glue stock, glue manufacturers run their limed stock through sulphurous water, and do not lose a particle of the glue material. This is as valuable to the tanner of sole and belt leather as to the glue manufacturer.

Sulphurous water is made by burning sulphur in a machine and allowing the fumes to charge the water. This machine was tried by a few tanners some years ago without any apparent results, because they did not know when to use the sulphurous water. One tanner procured a number of barrels of this water from a neighborly glue manufacturer and used it on his leather after it was split. There was no special benefit derived therefrom, except that it made a lighter color on the grain; but since the leather was to be curried in wax finish, where light color makes no difference to the tanner, he gave up using the water. Had this tanner and others used this sulphurous water for

a lime killer in the drench, the result would have surprised them. They would have found their hides free from lime, cleansed from all impurities and much less bark consumed in the tanning.

SULPHUROUS WATER IN HIDES VALUABLE.

Sulphurous water used on hides intended for the chrome tannage will be found valuable. Since no fermentation takes place by its use, it does not act on the gelatine of the hide. Having been in this water for a short time the hides become soft and white and free from lime.

The chrome tanned belt is not affected by the atmosphere whether it be hot, cold or damp, it being impervious to moisture as well as unaffected by extremes of heat and cold—and thus stretching and contracting are overcome. The grain does not crack after being tanned, and as very little oil is used in the stuffing of the leather, it is not affected by the evaporation of the oil.*

MANUFACTURE OF LEATHER BELTING.

A veteran tanner gives his experience as follows:

DRYING, STUFFING AND FINISHING.

The leather is taken from the scouring room and sammied, or, in other words, made about half dry. This is done by hanging up overnight. The night watchman employed, if any, is instructed when to take it down, and then dry spots are carefully dampened with water and the butts placed in piles of fifteen or twenty in a pile and left for twelve to twenty-four hours, according as time permits. This leather is then inspected to see that there are no dry spots on it, which, if found, are dampened, as the leather must be in uniform moist condition before being set. Special care should be taken not to have the leather so wet that the water will squeeze out when bent. If too wet the sett will not hold, so it is necessary for the condition to be medium damp, and experienced men can easily tell when butts are ripe for being worked.

CARE IN SETTING.

The men who do the setting should attend to the dampening, as they know exactly how to put the leather in proper condition for themselves. Unfortunately, skilled help is not plentiful, and when unskilled laborers are employed they cause so much extra work to the foremen and setters that it adds to the expense of producing the leather for market. When forced to use unskilled help, the foremen ought to have freedom to look after these men so that they can get the leather all right with as few mistakes as possible. Once the grain of leather is

* See also page 211.

damaged by setting, when dry it can never be smooth as it should be, but will be rough and unsatisfactory.

In these days of keen competition and labor troubles, a manufacturer is sometimes apt to commit the mistake of using unskilled help when irritated by the demands of labor agitators and is stimulated to prove to them he can get along without experienced workers. His feelings may be natural, but it is wiser to curb them and not cut off his nose to spite his face. We certainly can teach others to become more or less good artisans, but when they become expert they have a habit of demanding the wages paid to experts, and if one factory will not pay, others usually will. It also seems to me that it is better for manufacturers to pay as high wages as possible, and the good work done is so satisfactory, and usually so much of it, that the actual cost of same is less and is more satisfactory than when done by apparently low-priced men.

OILING AND STUFFING.

After belt leather is set the butts are cut into three pieces, from shoulder to butt, consisting of center and two sides. The size of the center is determined by the foreman of the belting room, as he knows what orders he has for double belting. The leather is then inspected and if sulphuric acid has been used in the tanning or bleaching it is necessary that the grain of the leather be oiled before it is stuffed. It should be stuffed with ordinary stuffing. More tallow is necessary in warm weather than in cold. I would vary this rule when the drying is mostly done at night by a careful watchman. When the shop is kept at a temperature of 70 to 80 degrees there would be very little difference in the make-up of the stuffing, which is usually composed of one-half oil and one-half tallow. The leather is stuffed but not set, and laid on the table and stuffed on the flesh side. The reason we make this difference from the ordinary way of setting leather is because it is set after it is half dry, but we will come to this later.

SETTING AND FINISHING.

After the leather is nearly dry it is taken down, dampened with a brush with hot water, then sett with a slicker or stone, as the needs demand. Before hanging up, apply on the grain a little stuffing, composed of three parts of tallow and one part of oil. Leave hanging until cold, then send the leather to the stretching room. Care should be taken not to put it dry on the stretchers, because if dry it would strain and the strength of the fibre might be strained. After leaving and stretching until very near dry the leather is removed and slicked on the flesh side, always keeping the back to you lengthwise on the table. Care should be taken to keep it clean, as this is all the finishing the flesh gets.

The grain is treated the same, only slicked off with a thick slicker. The marks on the leather, if any, should be now taken out, as this is the last chance for this purpose, because no marks can be removed after the leather is dry. Then follows the glassing, and when dried thoroughly, which takes about two or three days, the belting is taken down, brushed on the grain and given to the belt makers.

I would like to note that all leather shrinks in drying more or less, according to method of tanning. If well filled the fiber will hardly shrink, but if the tanning has been insufficient, or, as the trade would say, the leather "has a bone in it," it will shrink 1/32 of an inch in heavy leathers.

IMPORTANCE OF FILLING HIDE.

The wearing quality of leather belts depends upon the filling of the hide in the tan yard. It never pays to rush hides through the tan liquors and try to finish them into belting before the leather is thoroughly filled up in the yard. The belt foreman will tell you that in poorly tanned leather the splices will not hold and lack of solidity is an unpardonable fault in belting. Sometimes badly tanned leather belting will come back after being used two weeks, and someone has to pay charges one way or the other without getting any benefit. I have in mind a place where a belt was put in and went to pieces. The splices gave out and the grain was rough so they had to replace the belt twice, and finally took it off and ordered one from another firm.

It is much better for belt manufacturers to lose orders at unprofitable prices rather than try and make inferior leather. The men famous as leather belt makers today are those who have put quality before everything else.

Never forget that the big driving belt is virtually the mainspring of the whole factory. The smaller and more depending belts are all important in their way and when they break down or fail to do their duty, not only does it take time to repair them and replace on pulleys, but it also means the silence of many machines, with skilled men forced to be idle for the time being.

BEST BELTING COMES HIGH.

It is hard to lose a big order for belting and see a competitor win it, particularly when you know that your quality of belt would be actually cheaper than that which would be furnished by the successful bidder. The best belt makers have to charge comparatively high prices for belts, as they use only the best portions of butts for heavy belts, whereas competitors less conscientious have a habit of using leather that costs them less, but the quality will be poorer. The trouble, however, is, when a first-class belt and an inferior belt are placed side by side it is hard to distinguish between them. The real test comes when

they work day in and day out and then the first-class belt, honest throughout, stands up to the racket without flinching, while the cheaper belt fails to do its duty and cannot help advertising the lack of quality. Unfortunately, it takes time to demonstrate all this, and wide competition in the belting trade often places manufacturers in positions of temptation and regret.

CURRYING BELT LEATHER.

During a busy experience of twenty-five years in tanneries and belt shops in different parts of the country, says an experienced currier, I have had various experiences which I will describe to the best of my ability.

Let us begin in the scouring-room. The beamhouse has properly been called the nursery of leather manufacture and outside of this important place there is no department which should receive greater attention than the scouring-room. I am speaking about belting butts, and scouring or striking out is the groundwork or basis for the currying.

PLENTY OF HOT WATER AND STEAM.

I consider it of first importance that every scouring-room should have abundance of steam and water, so that there may be plenty of hot water, which should be kept at about blood heat. A kind of bloom or gum is contained in the grain of all belting leather that comes from the tan vats, and it cannot be worked out without the copious use of warm water, aided by hand work or the scouring machine. I consider the scouring machine the best method of working the grain on tanned leather. It makes it more flexible, and this counts for a great deal in the production of first-class belting leather. The tanned leather after it leaves the vats has a hard surface, and by the time that it passes under the scouring machine the leather should be soft enough so that the back of your thumbnail sinks into the grain when drawn across it.

The scouring machine has been one of the best friends of the leather trade, especially in connection with the working of heavy leathers. In scouring harness sides, extra work should be put on the flesh, which must be light and clean; success in this direction depends on the thoroughness of the work done in the scouring-room. The proprietor or foreman should be practical and able to know if the stock during its stages from beamhouse to finishing shop is in proper condition.

SCOURING MACHINES SHOULD BE FIRST-CLASS.

The scouring machine should be kept in first-class order or its work will be unsatisfactory. I am of the opinion that machines are

often run too fast and are thus liable to jump the work and prevent the springs in the machine from operating properly and exerting even pressure so that each stroke is done as it should be. The scouring table under the machine should be level and move easily to enable the operator to manipulate his leather without difficulty. I have seen tables that were so hard to move that it took two men to handle them, whereas a boy of from 12 to 15 years of age should have been sufficient for this purpose.

How much work should be fed to each machine each day? This should be measured by the ability of the man in charge and the superintendent of the plant should be practical enough to know when his leather is properly scoured and how much work, considering the heft of the leather, should be done daily. It is a mistake to employ men simply because they are willing to accept low wages. In my experience the cheapest men, as far as satisfactory results go, were those to whom I paid the highest wages. A well-paid man is not only stimulated to be quick and active in his movements, but is usually bright and intelligent and uses his brains when using his hands. No packs of hides are exactly alike and no two pieces of leather are similar in every respect. It is necessary, therefore, to employ men who are equal to whatever confronts them and who are able to employ good judgment and thus produce leather which is uniformly satisfactory in appearance when finished.

I know a concern producing harness leather that does not scour it, leaving the grain loaded with stuff that should be struck out by hand or machine. It weighs heavily, but it is inferior in quality to leather that has passed through the hands of competent workmen, and it is sold on the market at a price that seems cheap but actually proves to be as high, if not higher, than what is paid for the best brands.

SHOULDERS FROM BELTING BUTTS.

There are different ways of manipulating shoulders which are cut from whole hides intended for belting butts, says a practical man. Some tanners cut off the shoulders and flanks after the hide is tanned, but this is unwise and wasteful. Belting butts require pretty thorough tanning and the lighter parts, such as shoulders, which are made into lighter stock for welting, do not require heavy treatment. Shoulders and other offal of hides should be filled up so they will roll down solidly, but they do not require to be as long in the liquors as the thicker parts of the hides. It is better to cut the offal off early in the process and give it only such tanning as is required.

Belting butts are tanned for strength and toughness, but the parts cut off should have different treatment, as they are mostly for shoe purposes.

MILLING.

Let us first take the shoulders after coming from the yard. They should be milled in a drum 8 feet by 4 feet, with enough warm water to cover the leather. Possibly twenty shoulders would be enough for one run; time, from fifteen to twenty minutes, which will allow for the surface dirt to be cleaned off. Right here let me state that tanners who think the milling will remove the tannin and leave the leather flabby, are not fully posted on the art of tanning. It certainly would be a very poor process of tanning that would permit the valuable material being washed out, after a short drumming. The fact that the mill water is colored, should not be taken as a proof that it represents tannin, which is pretty expensive today, compared to the times when bark could be obtained for $2.50 per cord. Tanners not only put the tanning into the leather today, but know how to keep it there.

I consider the milling wheel as valuable as the scouring machine. After milling, the shoulders are skived clean, and if necessary, can be further cleaned in a liquor, then scoured and hung up to dry. When half dry they should be taken down, and dry spots dampened and the leather laid in piles to sammy, from six to twelve hours. If this is properly done the wrinkles and lines can be jacked out and leather thick enough for welting is split, so as to make 6½-ounce leather.

SETTING.

The leather is then taken and set out on the grain. By putting some stuffing on the table the shoulders will adhere to it. While setting out, use the stone, and then finish with the slicker. Give a fair coat of stuffing on the grain, although some would rather put the stuffing on the flesh. All leathers that are buffed, however, are generally stuffed on the grain, as stuffing fills the fiber and gives a finer job after the buffing is done. Leather well tanned does not need to be buffed, as the grain should not crack, as it is to prevent cracking that the buffing is required.

The leather is now taken to the welting room and cut into 4- or 5-inch strips, spliced, so that a piece 20 yards long is made. This is run through a small splitter and evened down, and then through a smaller machine and trimmed into ½- or ⅝-inch strips, as wanted.

BUFFING.

Shoulders which are too thin can be worked into buff or glove grain and sometimes are made into strop leather. These shoulders are first split into 4½-ounce leather, left over night, then set out good and hard on the grain across the table from the center. A mark is generally put in the center of the table, with copperas so that the operator can tell where to buff from. If not, there is danger of it running before

the slicker. Put on a fair coat of stuffing, hang up to dry, tacked on stocks. When quite dry, buff and soft-board four ways or more if necessary. No need to board the flanks much, as they will break up. After the leather is blacked with a weak solution of logwood for a sig, black with an ordinary copperas and iron blacking. When half dry give it a coat of weak lampblack. Glass down very fine, hang up and when dry put on a coat of oil. This will produce what is known as levant grain. If a bright finish is wanted, give three or four coats. If glove grain is required, only one coat. When blacked and dried, if you find hard spots on the leather, board them and then glass and finish. If your leather is properly buffed, boarded and glassed, the shoulders should be easy to sell.

EXTRACT-TANNED BELT LEATHER.

Don't start the hides in too strong lime at first. In a vat five feet square and six feet deep, one bushel of lime for the make-up with fresh water will be ample. Once you get the four limes started and full of hides, two strengthenings for each pack will be enough. No hard and fast rule can be laid down for the amount of lime required.

When taken out of the lime, the hair should start nicely on the hide in every place. Now when you draw a lime to unhair, run, say, one-third of the lime water in the sewer, and replace with fresh water to receive the new or green pack entering the limes. This will keep your lime fresh and sweet. Always bring your fresh pack into a lime not over strong. At least every fourth time around, the limes should be cleaned—and this providing four circular bottoms are put in properly, which is very quickly and easily done.

Have the bottoms put in with matched board so as to be tight, keeping dirt and lime from getting in back of the circular bottoms. On the side of the pit, where the plug leads to the sewer, leave a channel, say six inches wide, this channel being formed or made by one side of the pit, and closing up of the second circle, to which the boards of the bottom are nailed. With your plug out and a good stream of water through a hose pipe, you can wash the pit clean in five minutes.

A word of caution about running the lime wheels. Four times each day, not exceeding two minutes at a time, will be enough. This will represent four drawings or reelings of the old way, each day. Right here in this matter of liming comes in the result of your hides having been washed and made clear before going to the limes. In cold weather when the limes get too cold to work good, don't heat them up by putting a steam pipe into them, but run warm water into the pit when you run the one-third off for the fresh pack each day. This will take off the chill, and the results will be much more satisfactory.

UNHAIRING.

The hides are now ready to unhair. There should be two shallow tanks to the unhairing machine. A good size for these tanks is eight feet long, seven feet inside, and eighteen inches deep. Having first filled the tanks with warm water, at 90 degrees, put twenty hides (more or less) into one of them out of the lime. After leaving these for thirty minutes, put them through the unhairing machine. In the meantime we have the other tank filled with hides from the lime, so they will have a chance to warm through before going to the machine. In this way alternate from one tank to the other until the unhairing for the day is completed. Of course, put fresh, warm water into the tanks from time to time, as required.

After the hides go through the unhairing machine put them in your rinse wheel and wash them from five to seven minutes with plenty of water at summer heat running in and out of the wheel. The hides will now be ready for refleshing if they were not fleshed clean before the liming; and also for going over on the grain side with a beam knife to remove all the fine hairs and scud which may be left in the grain.

The time has now come when the offal—heads and bellies—should part company with the remainder of the hide. The butt or cropped hide needs de-liming or bating more thoroughly than the heads and bellies. The butt is for belt leather, the heads and bellies for sole.

BATING.

For bating, a paddle wheel is all but indispensable for butts, and of great convenience for the offal. Make your bate up for the butts with one gallon of lactic acid for each thousand gallons of water, and, if possible, put the bates into the bate wheel in the morning. This will give a chance to turn or run the bate wheel three or four times before the evening—thus insuring even action of the bate. If possible, have the wheels, both lime and bate, run for a couple of minutes each along in the middle of the night.

The heads and bellies should be delivered in a bate with not over one-half the acid which the butts require. For strengthening the bates for each succeeding pack, one-half the amount of acid used at start will be about the quantity. In cool weather six packs can be put through the bate before making up fresh; and in warm weather three packs. This matter of bating depends wholly for its success on the judgment of the beamhouse foreman, as no rules of any great value can be laid down. The idea is to eliminate all the alkali from the butts—and a large portion from the offal. After the stock has been in the bate over night, take it out and give both butts and offal a good washing in the rinse wheel for ten minutes, using water from 70 to 80 degrees. The stock is now ready for the liquors.

Having brought the hides through the beamhouse and got them ready for the liquors in the shape of butterheads and bellies, I will leave them there for a little while and say something about preparing extract liquors for use and the arrangement of tubs or tanks necessary for the proper handling of an extract liquor.

ESSENTIAL POINTS TO BE OBSERVED.

In using extracts these three essential points should be observed: First—Extracts are lacking in the acid or plumping quality of bark. Second—A hot extract liquor should never be brought in contact with a hot one, because in that case the reds and non-tannins will be thrown down, and it is important that these be kept in solution as much as possible, for they play an important part in the tanning of heavy leather. Third—Some portion each day of the extract liquor must be so nearly exhausted of its tannin that it can be thrown away in order to make room for fresh water in the melting or cooking tank; otherwise the liquors will become thick and gummy, and no straining through bark or any other device known to the writer will clear them wholly.

I have known of several cases where people started in to use extracts, not knowing this important essential, or if they did, wholly ignoring it. In fact, I myself ran into this no thoroughfare. At first the people I was with were more than favorably impressed with their success, but gradually it took longer and longer to do the tanning until finally the stuff all but refused to go into the hide, when of course a fresh start had to be made.

COOKING OR MELTING STOCK.

The first thing needed will be a cooking or melting tank. This should be placed high enough to permit its contents being drawn off into a tank below which I will call a mixer, and this mixer should not be down in a hole, but at least two feet above the floor or ground —that is, the bottom of it. Now, a good size for a cooker or melter is a round tank twelve feet in diameter and six feet deep in the clear. Put a false bottom into this tank made of one and one-half inch boards with plenty of five-eighths holes in it, and have this bottom three feet above the true bottom of the tank. Between this false bottom and the true bottom of the tank put an agitator or stirrer. This can be readily made by taking a hardwood stick eight inches square for the shaft—be sure and use the heart of the timber—no sap. Put a brass point on one end and a gear on the other or top end to revolve it, and a brass step in the bottom of the tank for this shaft to turn in. Say, six inches from the true bottom of the tank fasten on to this shaft the two blades for stirring the liquor. Put them on with brass

bolts and let them run within a couple of inches of the rim or staves of the tank, and slant the blades or paddles so that as they revolve they will lift up the liquor from the bottom. This agitator should make from twelve to fourteen turns per minute, and the shaft should extend up beyond the top of the tank high enough so that the gear which drives it will be out of head room. Over the top of this tank should be a tight cover or floor, and in case you use liquid extracts this floor should be strong enough to sustain the weight of at least four barrels of extract. Using solid extracts you would chop or break it up alongside the tank and push or shovel in and the cover would not need to be so strong. In this cover or floor you would want four doors or traps for liquid extracts, and two in case you used the solid extract.

THE MELTING TANK.

Now, as before stated, this melting tank should be high enough so that it can be drawn off into what I call the mixer, or the tank below. This mixing tank should be twice the diameter of the cooking tank or the one above, and five feet deep in the clear, and this tank should have an agitator or mixer, but no false bottom or cover. On the same level as this last tank should be four more of equal size—just open tanks for coolers or settlers. These should be graded, that is, the whole five. Beginning with the first or mixer, connect it eight inches from the top to the one next it with a pipe or log having a four-inch hole. Over the end or opening of the pipe or log in the second tank put an eye board made of three pieces of plank, with an opening in the clear of four by six inches, and reaching from the top of the tank to within a foot of the bottom. This will cause the liquor as it flows from the mixer into the first settler or cooler to go well down to the bottom of the tank. Connect the other three up in the same way.

Some provision must be made for cleaning these tanks out, as in them will gather all the settlings of your extract liquors. To make this provision, run a log under the bottom of the whole five tanks, branching up into each one of them near the edge or rim, and let this branch log go up through the bottoms of the tanks eight or ten inches, and well secured on its top with brass bolts, so that a plug can be driven into it without splitting. This will permit you to gather in these coolers eight or ten inches of sediment before cleaning.

At the end of this log furthest from the mixer connect a pump. The same pump that forces your cold liquor from the last cooler into the reservoir which leads to your tan vats will do this work by having two connections on the suction, one into the last cooler and the stirrer into this log running under the coolers.

TO CLEAN THE TANKS.

Now, when you want to clean these tanks, pump the last one out into the reservoir leading into the tanyard, clean it, then draw the plug leading into the log in the tank next to it and pump the liquor out of this one into the one you have cleaned, and go through the five tanks in this way. Of course, the pump will want two discharges as well as suctions. You can use a hose pipe for conveying the liquor from the pump to any one of the tanks. The time between the cleanings will be wholly governed by the amount of extract you use each day—once in three months, providing you use the series of tanics up to their full capacity.

ADD TWO MORE TANKS.

As near as possible to your cooking and mixing tank without their being in the way, and on the same level as the cooking tank, place two more tanks, each one of capacity enough to hold the balance of your spent or partially spent liquors each day, outside of what you require for the melting tank. Into each one of these tanks run an open butt steam pipe six inches from the bottom, and not straight into the center of the tanks, but looking towards the quarter, so that the force of the steam will cause the liquor in the tank to revolve. Also into your cooking or melting tank put an open butt steam pipe three inches from the bottom—under the paddler or blades to the agitator.

THERE SHOULD BE A WATER PIPE

to discharge into the cooking tank and each time a melting is made at least one foot of water should be run into the tank; the balance can be spent or partially spent liquor. Of course, in filling your melting tank you must leave room for the extract and the heating. Have this tank heated up to, say, one hundred and fifty degrees, then put your extract in, keeping the steam on until the boiling point is reached. Start the agitator when you begin putting in the extract, and let it run a couple of hours after shutting off the steam, then turn on the steam and bring the contents up to the boiling point again, leaving the agitator working constantly. If this can stand over night before drawing off and have a little stirring before drawn, all the better. You will want a pipe for each of the receiving tanks for spent liquor leading into the mixer, with valve or cock in each one, so as to regulate the flow of weak or spent liquor into the mixer.

THE MIXER.

Have the spent liquor heated to about 150 or 160 degrees, and when you start the liquor running from the cooking or melting tank

into the mixer, set the spent or partially spent liquor running into the mixer also, from which over one of the two receiving tanks you have full and hot, and, of course, when you begin to run the liquor into the mixing tank, set the stirrer or agitator going and do not stop it until you are through running liquor into the tank. As this mixer fills it will flow over into the first cooler and down through the whole series. And if you find your liquor does not get cool enough in the four coolers, add on another, as it is very essential that the liquor should be thoroughly cooled before going to the tan vats. This melting tank will dissolve 2,500 pounds of solid or 4,000 pounds of liquid extract at each cooking or melting. This should be the limit, and one cooking each day will produce better results than to crowd it for more. There may be other and better ways and arrangements, but the writer is not aware of them and he knows this will put in available shape all the tannin there is in the extract.

STOCK READY FOR THE LIQUORS.

We now have the stock ready for the liquors, and a way or system for preparing the extracts so that we can utilize all the tannin they contain. Now, if we bring the beamhoused stock and the extract liquors together, and do it properly, we shall have a belting butt of fine color, good strength and weight. I know I cannot, and I hardly think anyone else can, lay down hard and fast rules for converting the raw butt into leather. Right here comes in the skill and experience of the tanner. All I can hope to do is to help him to avoid some of the mistakes and errors which I have fallen into, and being one of the first users of extracts, I had to feel my own way along, as there was very little information to be obtained from others.

Before we make any talk of the liquors we are going to give this beamhoused stock, it may be well to write of the size and shape of the tan vat best adapted to the handling of this whole hide or butt.

THE TACKING.

The writer would advise the tacking of the butt onto a stick, letting the shoulder end hang down, and using for this purpose the brass nail made by the Charles Holmes Machinery Co., of East Boston. The sticks should be 2½ inches wide, ⅞ inch thick. The length will be governed by the size of vat, but they ought to be six feet long. A good size of vat for these butts, in the writer's opinion, is one eight feet long, six feet wide and eight feet deep. This size vat will hold 100 butts, and give the necessary room for the proper circulation of the liquors. In case of vats not deep enough for the butts to hang down straight, they can be thrown over a stick and suspended in that way. When this is done, it will be found of advantage to have

cleats or pins in the bearers upon which the sticks rest in order to keep the butts from touching each other in the liquors.

THE VATS.

There should be two series or sections of vats, each section consisting of twelve vats of the above size, and these two sections will put through 100 butts each day, alternating each other in taking out and putting in from the beamhouse. Ten vats in each section should be graded; that is, the strong liquor flowing in at the head or strong vat from the coolers, and grading down through the series of ten vats by means of eye-boards. This arrangement is well known to all tanners and needs no explanation. The overflow from the weak or last vat in this series of ten should discharge into a tank, where it can be pumped either back to the extract house or the amount required for the colorers into them. It may also be drawn from the weak vat by means of a log such as most tanneries have running under the vats and leading into a jun, and from there pumped as above.

COLORERS AND HANDLERS.

Now we have ten vats in each section graded, leaving two vats in each series not connected with the balance of vats in their section. These two end vats in each section I shall call colorers, and the ten graded vats in each section handlers. Take the two coloring vats belonging to its section and connect them by a three-inch hole between them, eight or ten inches from the top of vat, with an eye-board reaching to within six inches of the bottom of the first vat—that is, the one next the ten vats already graded. These two sections are to be entirely separate and distinct from each other both in the handlers and colorers.

There are rockers and systems of moving the liquors and not the stock, which, of course, saves much labor and cuts the time of tanning down very materially, but it is not the purpose of this article to take any of these devices up.

The liquors we shall use in the colorers will be a part of what has graded down through the ten connected vats in each section, or the handlers. The portion or part we do not use for the colorers will be pumped back to the extract house and there strengthened up and made ready to use over again.

COMBINATION OF EXTRACTS.

A first-class combination of extracts for these handlers and colorers is 50 per cent quebracho, 30 per cent chestnut or oak wood and 20 per cent palmetto extracts. This will give a fine color and produce very strong, plump, mellow leather. The three extracts named

above can all go into the melter or cooker together in the proportions named. The green stock from the beamhouse will go each day into one or the other of the first vat of colorers in each section. The idea is to alternate these two sections, using one today and the other tomorrow. By this arrangement the stock will remain in each vat two days, and each pack or day's work will pass through each of the twelve vats in the section which it enters from the beamhouse.

When the vats in both sections are filled with stock, take out the head or best tanned pack in one section of handlers and move the remaining nine packs ahead one vat. This will make room for the oldest pack in the colorers to go over into the handlers, and the other pack in the colorers to be moved ahead. This makes the vat for the stock from the beamhouse.

LIQUOR TO BE REDUCED.

Now, the liquor in this first coloring vat should be so reduced in strength that every other day, when the green butts come into it from the beamhouse, a part of it can be drawn off into the sewer in order to make room for the water run into the cooking or melting tank each day.

Do not depend on the barkometer to tell you the amount or per cent of tannin in this weak or tail vat. The writer has seen a weak or tail extract liquor which the barkometer indicated contained 22 degrees tannin, and the same liquor, when analyzed by two good trade chemists, was reported as containing less than 1 per cent of tannin.

ANALYZE YOUR LIQUOR.

When you get the leather in the handlers where you want it, and your liquors running regular, have some of this weak liquor analyzed by a reputable trade chemist, and at the same time test it with the barkometer, and then you will be better prepared to form a correct idea of what you are throwing away.

BELTS AND BELT LEATHER.

Good time and money may be wasted by using belts that are not up to the standard, writes an old tanner.

Many substitutes for leather belting have been used, but they all proved more or less unsatisfactory, and sooner or later every one comes back to the old leather belt. Manufacturers of substitutes claim special superiority and dwell upon cheapness. Substitutes are cheaper at first cost, but a period of months or years develops that they are more expensive. The advocate of the cotton belt does not tell that the edges have a way of wearing off, causing the belt to

unravel. The advocate of the India rubber belt cannot be expected to tell a prospective customer that his product blisters.

While a good leather belt is the best, and in the long run the cheapest, it must be admitted that some leather belting fails to give satisfaction. It does not possess the right degree of pliability, and in some instances the tensile strength is not sufficient.

INJURY IN OVER-LIMING.

Belt leather is sometimes injured in the process of tanning by over-liming and sometimes by over-drenching, notwithstanding the importance of removing all traces of lime from the hides.

When belts were first used for the transmission of power they were made from strips of raw hide, and there is no denying that these primitive belts could be depended upon. The first manufactured leather to take the place of raw hide belts was depilitated by the use of lime alone. This belting was not entirely satisfactory, because there was a spongy expansion of the fibers and too great a loss of hide substance. Sulphide of sodium, however, has helped the manufacturer of belt leather out of this difficulty. By using sulphide of sodium in the right proportion the fiber bundles of the hide are split up in much less time and the loss of hide substance is appreciably less. This gives a belt of much greater strength and suppleness.

In the conversion of a hide into leather it is necessary to split up the fibrous structure of the hide, but in the manufacture of belt leather it is very important that the fiber bundles should be split up in the quickest possible time, else too much of the gelatinous tissue of the hide is lost. A belt must of course possess suppleness as well as strength, but there is no fear that not enough of the gelatinous tissue of the hide will be dissolved.

DIFFICULTIES IN CHROME PROCESS.

It is true that tanners here in our country are finding some difficulty in imparting the right degree of softness to the leather in the finishing, tanned by the chrome process, but they are doing it abroad. Some samples I have lately seen were pliable and of great strength and had the appearance of having been given a small amount of vegetable tannage. The flesh and grain were but slightly colored, showing that whatever vegetable tannin had been used had not penetrated the body of the leather to any great extent. The trouble with us has been that in trying to give chrome leather some softness as well as plumpness by placing it in a vegetable tanning liquor, the leather has become tender and the grain drawn. This takes place to a greater degree if the leather has not been thoroughly washed before placing it in the liquor. Some tanners say that if the leather is thoroughly

washed and all acid killed it will be found that the tanning liquor penetrates very slowly, and for that reason a gambier or quebracho liquor is preferable to a bark one.

Chrome tanned belt leather is not affected by the atmosphere, whether it be hot, cold or damp, it being impervious to moisture as well as unaffected by extremes of heat and cold, and thus stretching and contracting are overcome. The grain does not crack after being tanned, and, as very little oil is used in the stuffing of the leather, it is not affected by the evaporation of the oil, as is the case with belts tanned in oak or hemlock bark.

LACTIC ACID GETS UNIFORM RESULTS.

In the manufacture of belt leather much trouble has been experienced in over-drenching the hides, it being of so great importance to remove all the lime. Some tanners have been over-zealous in the matter and have injured the strength of the hide. Sometimes, even with the greatest precaution, the bacteria in the drench will, if all the conditions are not right, attack the hide substance before all the lime is removed. For this reason many tanners are today using lactic acid instead of the manure drench in the manufacture of belt leather. Not only do they get more uniform results, but the lactic acid is of course much pleasanter to use.

After the leather manufacturer has done his best toward the manufacture of a good belt it is up to the belt maker to see that only the correct part of the hide for the purpose be cut up for belts, and it is then up to the man who uses the belt to see that it gets proper attention.

Chrome Tanning.

PREPARING HIDES FOR CHROME TANNAGE.

Much has been said and much has been written relating to the proper condition of hides and skins to receive the chrome tannage. A hide or skin may be well worked in the beamhouse, under the direction of a practical tanner who is using a certain one-bath chrome tannage and making good leather by its use; then again the same hide or skin, worked in the same manner but tanned in a different one-bath chrome liquor, will make a far different piece of leather, either being pipy or too soft on the grain; this latter condition due to the acid contained in the chrome liquor and also the salt used to overcome this acidity. Acids swell hide fiber and help to split it up, and, if this hide fiber is well split up in the liming process it will not stand a tannage of chrome liquor containing a strong portion of acid without making a pipy leather, especially if for the patent finish.

ONE-BATH PROCESSES.

Take the two leading one-bath chrome tannages on the market—both capable of making good leather under the proper conditions—and you will find on going into one tannery that the tanner will tell you he is using such a man's liquor and it is the only one that is any good; he has given the other fellow's liquor a good trial and it is of no use—even the salesmen of the goods have been given a chance to try it and have fallen down.

In perhaps the very next tannery you will find the tanner using the one-bath liquor condemned by the first tanner, and he will tell you that the tannage used and recommended so highly by the first tanner is not worth a tinker's dam. Now, both of these tanners are making satisfactory leather, each from a liquor condemned by the other.

Instances such as these cited are rather discouraging to the salesmen who understand perfectly the particular tanning liquors which they demonstrate and the manner in which they should be handled, but do not understand so well the manner in which the hides or skins have been prepared for the liquor.

These instances go to prove that either one of the so-called one-bath chrome liquors is capable of making good leather if the hides or skins have been so depilated as to meet the action of the tannage. In one case more liming is necessary; in the other less. The necessary amount of liming to bring the hides or skins to the proper condition for certain results must be studied out and when this condition has been reached the next thing is to bring each lot out uniformly.

LIMING FOR CHROME.

The method of liming hides and skins for the chrome tannage is far different from that in liming for bark or any of the vegetable tannages and the quicker a tanner who is obliged to manufacture chrome leather in place of bark understands this the better it is for him and the sooner his leather will be "goin' some."

THE FIELD FOR HEAVY CHROME LEATHER.

The field for heavy chrome leather is unlimited. There is no question but what chrome tanned leather is far superior to any other leather tanned for such purposes as belting, harness, valve, lace and sole leather. The only objection is that it is too dry. With the right kind of stuffing chrome leather will prove in the class of heavy leathers what it has done in the upper leather—that it is the leader of all tannages. There was a feeling as far back as 1896 that chrome leather would make good belting leather, and a few of the progressive tanners took it up with very discouraging results. Most of them dropped it, but one or two of them stuck to it, and today it is the coming leather for belts. It will stand any kind of drastic treatment. If properly made, a chrome belt once put on a machine or shafting will never have to be removed to take up the slack, for there is absolutely no stretch in it. When chrome belting leather was first made it was stuffed full of grease and oil to make it waterproof, so the belt curriers thought, and they could not cement it, but after repeated trials it was found that it was not necessary to fill it with grease to make it waterproof belting. It is now treated with a fat-liquor to make it pliable, and the trouble of cementing it was overcome.

The bark tanners found fault with it; they said it was no good; it would not wear. They were like our forefathers, who poked fun at the first steamboat that went up the Hudson river; but it has come to stay—not only to stay, but to forge ahead. The reasons are: It is strong, will work equally as well in damp, wet cellars full of the fumes of all kinds of acids, as in a dry room. It will not stretch, it will not burn and crack if it is put on a pulley or machine that runs fast. It will not create electricity and cause air cushions to form between the pulley and belt, causing the belt to slip.

OBJECTION TO CHROME BELTING.

The only objection to chrome belts today is that they do not weigh enough, so some belt makers say. They claim that a large belt, to give perfect satisfaction, must be heavy. I do not know, so must take their word for it; but that can be overcome by giving the belt a dry stuffing. The people who are making chrome belts today are making the same mistake as the tanners who first made chrome upper leather. They think it must be heavy in substance. They think it must be just as thick as bark-tanned belting, and that is where they make a mistake, for a chrome belt just half the thickness of a bark belt will do just as much, if not more, work. The reason is this:

COMPARE BARK AND CHROME TANNAGES.

Take hides of the same weight and tan some into bark leather and some into chrome, and you will get a much thicker piece of leather in the bark than in the chrome tannage, but you will have a much larger and stronger fiber in the chrome than in the bark. In the chrome leather you have nothing between the fibers to interfere with their being interwoven, which gives strength, while in bark or any kind of vegetable-tanned leather you have the hide full of vegetable matter that causes the fiber to dry rigid and not to unite and make as strong leather as chrome. This has been proven in the case of glazed kid. Ten years ago very few men wore a kid shoe. The best men's shoes were made of calf, because kid shoes would not stand the wear. But look at the men's shoes made from glazed kid today. They will outwear the best piece of sole leather that can be put on them. Chrome leather for soles is not a success as yet, for the simple reason that it will get very slippery in wet weather, it will not channel and they cannot burnish the edges. All it requires is a stuffing of some kind and the trick is done. It will not be very many years before it is done, then good-by to the shoe with the heavy sole. What a blessing it will be when we can buy a pair of shoes and have the sole wear as long as the upper, for such a thing is impossible today, no matter what you pay for your shoes.

WHAT CHROME TANNAGE HAS DONE.

It is a well-established fact that while the upper leather tanner has progressed in the making of his leather in regard to time and strength (with the assistance of chrome), the sole leather tanner has also shortened the time of tanning from six months to forty days. He has also shortened the wearing quality of his leather from nine months to forty days. This same argument holds good in regard to harness leather as in the case of sole leather. Years ago, when a harness maker

bought a lot of harness leather with a reliable trade-mark on it, he felt sure he was getting a good piece of sole leather. The old trade-marks are still found on the leather, but what a change in the leather.

WATER USED IN CHROME TANNING.

Tanners who are starting in to make chrome leather will do well to have the water they are going to use in the beamhouse and for tanning analyzed. If they have well water that is hard they will find it will give much better satisfaction all the year if used in the soaks and limes than soft water that comes from a stream, or the city water, because well water runs about the same temperature all the year. Another reason is that it is not as liable to have any organic matter in it. For the bate wheel, river or any kind of soft water is the best, for a bacterial bate will work much more satisfactorily in soft water than in anything that will cause water to be hard.

SOFT WATER BEST TO USE.

When it comes to the pickling, tanning, dyeing and making of fat-liquor, soft water is much the best to use. If you have no other water but that which is hard, you must use a little more acid in your pickle. Do not do as the laundry man would—soften the water with borax or sal soda. Hides to be pickled should go into the bate in a perfectly neutral condition, then with a properly made pickle you will get first-class results. If the water is hard it will reduce the strength of the acid to a certain extent, and instead of the hides getting the full amount of the acid, they will be under-pickled. This same theory holds good when you use hard water for tanning, coloring and fat-liquoring. The elements that cause the water to be hard will be antagonistic to the material used in these different processes, and it will require a little more of each material used to get the same results than if you use soft water.

GREAT CARE NECESSARY IN THE USE OF RIVER OR SURFACE WATER.

If river or surface water that is soft is used in the limes and soaks, great care must be taken when the seasons change, as hides will not stand as much soaking in warm weather as in cold. When soft water is used neither will they require as much lime in warm weather as they will in cold. Often you will hear tanners complain in the spring about their leather being too loose on the grain, and in the fall about the leather being hard. When they use surface water, as a rule, in the beamhouse they will go through their whole system trying to locate the trouble, which is all caused by the water changing temperature.

SPRING WATER.

In some sections of the country where tanners are located and use brook water that comes from springs, the water will be hard, which is caused by lime rock formations. As a rule, tanners using this kind of water will work their plants with the idea that the water is hard, as it is all the year round except in the early spring when the snow commences to melt and runs into the brooks. The water will then be soft, as everyone knows snow water is soft. If the tanner does not make allowance for the soft water, he is liable to get a lot of loose leather, and will go through his entire system of working and worrying night and day trying to locate the trouble, but he will not find it. After a while his leather will be coming all right again, but not so long as there is snow on the ground. When his trouble is over, if he will look around where the water he uses comes from, he will find the snow all gone.

Water that will scale a boiler is no good anywhere except in the limes and soaks, and water that has iron or sulphur in it is very poor water to use in either blacking, fat-liquoring or making fancy colors. In fact, the very best results are obtained in making fancy colors when distilled water is used.

TANNING CHROME COW HIDES AND KIPS FOR SPORTING GOODS LEATHER.

To make leather for sporting goods from cow hides and kips, the tanner must start in the beamhouse. He should never work a hide weighing over 40 pounds for this kind of leather, and he must trim his hides and skins closely in the beamhouse, for the cutters of leathers for sporting goods will not stand for long shanks and long neck pieces. If cut off in the beamhouse the shanks and necks will bring more money than if they are allowed to go through the tannery and are trimmed after the leather is made.

To start with, the hides or skins should be soaked 24 hours; put in a mill and milled for half an hour, and put back into the soaks for 24 hours, taken out and split into sides (if hides are being worked) and fleshed. They are then put into a clean, fresh soak for 24 hours and from there worked through the lines by the following system:

LIMING.

Use 10 per cent of lime and 1 per cent of arsenic, liming eight days. In the first day's lime use 1½ per cent of lime and allow hides to remain in the lime 24 hours; haul them out and strengthen up with 1 per cent of lime and allow to stay 24 hours. Then make up a lime in vat No. 2, using 1½ per cent of lime, and allow hides

to remain 24 hours, then haul the hides out and add 1 per cent of lime to the No. 2 vat, and replace hides and allow to stay 24 hours. Now make up a lime in vat No. 3, using 1½ per cent of lime, and put in the hides and allow to remain 24 hours, then haul out hides and strengthen up lime with 1 per cent of lime and ½ per cent of arsenic, replace hides and allow to lie 24 hours. Make up a lime in vat No. 4, using 1½ per cent of lime. Put in hides and allow to lie 24 hours; haul out hides and strengthen up lime with 1 per cent lime and ½ per cent arsenic. Replace the hides and allow to lie 24 hours. They are then put into water 80 degrees Fahrenheit and allowed to lie four hours, when they are ready to unhair.

UNHAIRING.

The unhairing can be done on a machine, as this system will make the hair come very easily. After the hides have been unhaired on the machine, they are put into a wash mill and washed with running water 20 minutes. They are then ready for the bate. If they are to be split out of the lime they are refleshed after washing and put into cold water over night to harden up for splitting. In splitting from the lime be sure and trim all tag ends and pieces of flesh from the hides before starting to split, so there is nothing to interfere with the hide feeding into the splitting machine freely.

In splitting hides from the lime with this beamhouse system, split the grains one ounce more than you want the finished leather. For example, if you want a piece of leather four ounces, split grain five ounces, as it will fall about one ounce going through the works. After the hides are split, the grains are washed in cold water for five minutes and are ready for the bate.

USE BACTERIAL BATE.

To bate this class of leather it is necessary to use a bacterial bate, either a dog or chicken manure bate or one of the commercial bates on the market. If a commercial bate is used, the firms selling it furnish directions how to handle. If a chicken manure bate is used, the manure is prepared by soaking two barrels of manure in a 50-gallon barrel. Put in the manure and fill up the barrel with warm water 120 degrees Fahrenheit. Stir the manure well and cover the barrel to retain the heat and allow to stand three days. Have a screen made of ⅜ mesh wire screen. Make it so it will fit in a barrel, and when you are ready to bate the hides stir up the manure and work it through the screen to remove all foreign matter, such as bones, feathers and cinders, which are always found in chicken manure.

BATING LIQUOR.

To make up a bating liquor, use the barrel of soaked manure to start a new bate. Warm the bate liquor up to 100 in the winter and 85 in the summer. Get the hides in the bate as early as possible and run the reel one hour. Then allow the reel to stand one hour. If the hides have been split from the lime, run the reel one-half hour. The split grains should be bated enough in two hours, but it will take five to six hours to bate hides that are not split, and three to five hours to bate kips. The man in charge of the beamhouse must use his judgment as to when they are bated low enough. Hides for this kind of leather must be bated more than hides for chrome shoe leather.

PICKLING.

After they are bated they are washed in warm water (80 degrees) ten minutes for the split hides and twenty minutes for whole hides and kips. When washed, they are ready to pickle. If the pickling is done in a drum, use two pounds of sulphuric acid, 12 pounds of salt and 15 gallons of water for each 100 pounds of hide weighed from the wash wheel. Run split hides in the pickle three-quarters of an hour and whole hides and kips one and one-half hours, then horse them up to drain 24 hours. If the pickling is done in a paddle wheel, put into the reel 50 pounds of salt for each 100 gallons of water; add to the salt water two pounds of acid and eight pounds of salt to each 100 pounds of hide. Run the hides in the pickle one and one-half hours and take out and horse up if they are split. If they are whole hides or kips, run in the reel two hours and allow to lie over night. The next day run the reel fifteen minutes and horse up to drain 24 hours. The hides are then ready to tan.

TWO-BATH SYSTEM.

If the two-bath system is used, dissolve 6 per cent of bichrome of potash by boiling in three gallons of water, then cool down to 80 degrees by adding cold water to make 12 gallons. Add to this chrome solution 1½ pounds muriatic acid. Put hides in the mill, add the chrome solution and run mill three hours if the grains are split, and six to seven hours if they are whole hides or kips. After running the required length of time in the chrome, horse them up to drain 24 hours, then dissolve 20 pounds of hyposulphite of soda in four gallons of water and cool down by adding cold water to make 15 gallons in all. Put the chromed hides in the mill, add the hypo-solution and start the mill. Then take three pounds of muriatic acid and put it into a pail of water and add it to the mill through the gudgeon while the mill is running. Allow the mill to run 3½ hours if the hides are split grains and six to eight hours if they are whole hides or kips. After they are tanned, horse them up to drain 24 hours.

ONE-BATH TANNAGE.

If one-bath tannage is used, which is the safest to handle, as well as the most economical, the hides are weighed after being horsed up over night, and for each 100 pounds make up a salt solution, using two pounds of Glauber's salt, five pounds of common salt and 15 gallons of water, 85 degrees. Run the pickled stock in this salt solution three-quarters of an hour if split, and one and one-half hours if not split. Then drain the mill and add to the mill a salt solution, using 5 pounds of common salt and 10 gallons of water, 85 degrees. Start the mill and in the meantime dissolve 14 pounds of concentrated chrome liquor in six gallons of hot water. Add one-third of this chrome liquor to the mill and run one-half hour. Then add another third and run one hour, and then add the remaining third and run until the hides are tanned, which will take six hours if the hides are split and 24 if they are whole hides or kips. The 24 hours means to run them at least three hours after the last portion of tan liquor has been given, then stop the mill and allow the hides to rest until the next day. Then start the mill and run until they are tanned.

TANNING TEST.

To test for tanning, cut a piece from the thickest part of the hide and boil it for at least five minutes. If it does not curl up, the hides are tanned. If they do curl, the hides should remain in the tannin until they will stand the boiling. When tanned they are horsed up for 24 hours and the whole hides pressed, split and shaved, and the split hides pressed and shaved. After they are shaved, they are washed in running water one hour with a generous supply of water. They are then ready to color and fat-liquor. The two-bath and one-bath liquor is handled just the same after the tanning is finished .

CHROME TANNED LEATHER.

Use light hides to start and soak twenty-four hours. Then put in wash mill and wash for half an hour and put back into clean water for twenty-four hours. Now flesh clean and make up a dehairing solution as follows: For each 100 pounds of hide slake 3 pounds of lime, and while the lime is slaking add 3 to 5 pounds of red arsenic. Put the arsenic and lime solution into a paddle wheel with water enough so the hides will turn when the wheel is running. Put in the hides and run the wheel for one hour and allow the hides to rest in the lime over night. The next day run the paddle one hour in the morning and one hour in the afternoon.

UNHAIRING.

On the morning of the third day put the hides into warm water 90 degrees Fahr., and allow them to lie two to four hours. They are then ready to unhair.

After unhairing, wash in a wash wheel half an hour, when the hides are ready for the bate. It will be seen that the hides are very flat. They do not plump up in the lime and arsenic solution. This keeping flat insures a very long and strong fiber.

To bate these hides, have a paddle of warm water, 90 degrees, and for every 100 pounds of hide put into the paddle one quart of lactic acid, 18 degrees, and 8 pounds of salt. Run the hides in the paddle one hour and allow them to rest over night. In the morning run the paddle thirty minutes, take out the hides and wash in wash mill ten minutes. They are then ready to pickle.

PICKLING AND SPLITTING.

The pickle is made as follows: To each 100 pounds of hide (weighed after draining one-half hour from the bate) dissolve 4 pounds of alum and 10 pounds of salt in 15 gallons of water. Put the pickling solution into the drum and then put in the hides. Run the drum one and one-half hours, take out the hides and horse up smooth to drain twenty-four hours. If you have a corrugated roll on your splitting machine, you can split them right off the horse. If you have a smooth roll you will have to sammy or press them to get them into condition for splitting. Split the grain just a little heavier than you want your finished lace to be.

After the hides are split, weigh the grains, and for every 100 pounds make up a salt solution, using 8 pounds of salt and 15 gallons of water. Run the grain in the solution thirty minutes, if the hides were pressed, and ten minutes if they were split wet. Now take 12 pounds of concentrated one-bath tan liquor and put into 10 gallons of hot water, stirring until dissolved. Take one-quarter of the tanning solution and add it to the hides in the salt solution and run the drum for half an hour. Then give another quarter of the tanning solution and run for half an hour. You will then see that the hides are struck through with the tanning solution and are ready to receive the remainder of the tan liquor. After giving the last portion of the tan liquor, run the drum five hours and the leather should be tanned. But if you are not sure, allow the leather to remain in the drum over night and run an hour in the morning. The hides are then horsed up nice and smooth for forty-eight hours. Now put them into a mill with a solution of borax, made as follows: Dissolve 1½ pounds of borax in 15 gallons of water and use at a temperature of 110 degrees. Run the hides in the borax solution 30 minutes, then put them into a wash mill

and wash one hour with a generous supply of running water. If the water is scarce, wash longer. They are then ready to fat-liquor.

DYEING.

If you wish to color them it is best to color just before fat-liquoring. To make yellow lace leather make the following dye: For each 100 pounds of leather dissolve 1 pound of extract of fustic in two gallons of water. When thoroughly dissolved allow to cool to about 165 degrees and add 4 ounces of ormine yellow, stir well and allow to stand. Now, for every 100 pounds of leather dissolve 1 pound of morocco soap in 3 gallons of water by boiling, then add to the dissolved soap 2 pounds of common degras and boil for half an hour. Cool down to 165 degrees and stir in the solution the fustic and yellow dye and stir well. Put the wash leather into the fat-liquor mill and put in about 5 gallons of hot water, 180 to 200 degrees, for each 100 pounds of leather, run the mill ten minutes and put in the fat-liquor and dye solution, then run the mill for half an hour. Take out the leather and horse up over night; the next day hang the leather up to dry. (Do not set out.)

FAT-LIQUORING.

When it is bone dry put it in the fat-liquor mill and put in 15 gallons of hot water for each 10 sides, 150 degrees Fahr. Wash in this for one-half hour, and in the meantime make up the second fat-liquor as follows: Dissolve 1 pound of morocco soap in 3 gallons of water by boiling, then add to the soap solution 3 pounds of common degras and 2 pounds of neatsfoot oil and boil for half an hour. (This amount of fat-liquor is for each 10 sides.) Cool down to 160 and add salts of tartar, previously dissolved in 1 gallon of hot water. Drain the hot water from the leather and put in the second fat-liquor and run half an hour. Take out and set out on the grain side and oil off with neatsfoot or cod oil. Tack out on tacking frames and stretch well. When dry, if they are not soft enough, damp by dipping in hot water and piling down over night. The next day stake and hang up to dry.

SUPERIOR LACE LEATHER.

This method will make a lace leather far superior to any raw hide or vegetable lace ever made. It will be stronger and not burn when it strikes the pulley as it goes over. It is a cheap way to make a lace and you can get quite a split from the hide that can be sold for glove leather, or it can be tanned same as the grain and sold for a cheap lace leather. If you do not care about the yellow color, just cut out the fustic and yellow dye and use fat-liquor same as directed.

MANUFACTURE OF CHROME BELTING LEATHER.

That chrome tanned belting has come to stay, there is no doubt. Those who have tried a chrome belt have nothing to say against it. When chrome belts were first put upon the market they were supposed to be for wet work only, but now it is known that they can be and have been used in all kinds of places and under all kinds of conditions, and not found wanting.

We have in mind good, straight tanned chrome belts. There have been made some belts called chrome that were chromed first, then re-tanned in a vegetable tannage to plump the leather, and sold for chrome; but this class of leather is not chrome; it is not as good as chrome or straight vegetable tanned leather. As soon as chrome leather is re-tanned in vegetable tannage, where over 3 per cent of the vegetable tannage is used, it has lost its character and has no strength, and it is dry, empty and, in fact, no good. Some tanners started to make this kind of leather so as to get a large yield from a light hide, but it did not work, and in a few cases injured the straight chrome belt.

TO TEST CHROME BELTING.

When buying a chrome belt there are a few points to go by in order not to be "buncoed." The leather is either a sea green or robin's egg blue. You can cut a piece off and light a match to it, and if it is chrome it will take a long time to burn it. If it is vegetable tanned it will curl up quickly and burn.

In the making of chrome leather for belts it must be borne in mind that a good, heavy piece of leather cannot be made from any hides that weigh less than 60 pounds in the hair. There is a large percentage of leather from this weight of hides that will have to be worked into a double belt. To make leather heavy enough for a heavy single belt, the tanner must work a hide from 80 to 100 pounds in the hair, as it is impossible to plump a hide in the chrome tannage. We hear of tanners who are trying all kinds of schemes to plump chrome stock. They had better save time and money, for just as soon as chrome is plumped it will lose its strength and character. It is the close condition of the fiber that makes chrome leather so strong, and when a material of any sort is worked into the leather to keep the fiber distended, it prevents the interlocking of the fiber, and the leather will be tender. This peculiar formation of the fiber in chrome tanning is what prevents the tanner from getting the same amount of measurement that he gets from a vegetable tanned leather. When it is well known that hides tanned into chrome leather cannot be plumped, the tanner, to be successful, must work his hides through the bran-

house so as to get his stock soft and in proper condition to receive the tannage and not lose any hide substance.

GOOD, PLUMP HIDES NECESSARY.

To start to make leather for chrome belts, the tanner must get good, plump hides that will soak up soft in 48 hours. He should string them in the soaks; that is, hang them in with strings or hooks, and not throw them in the soaking vat in any old way and expect to get uniform results. When they have been in the soak 24 hours, put them in a mill and mill for 15 minutes without any water, then turn on the water and mill for 5 minutes longer, so as to wash out all the dirt. Next put them back into the soak for 24 hours. When the time is up they are ready to flesh, either on a machine or by hand. A machine for whole hides must be used, as the leather must be made up into butts, not sides, for butts cut into strips for belts more advantageously than sides. After the hides have been fleshed they are put into cold, clean water for a few hours and worked from there into the lime.

LIMING.

First-class leather can be made with this beamhouse method: Have a row of five lime pits to start the first pack. Use 2 per cent of lime (to the green-salted weight) in the first pit. Be careful to put the hides in the lime flat and allow them to stay at least twenty hours; then into pit No. 2 make up a lime using 2 per cent lime and one-half of 1 per cent of sulphide. Put the hides into the second pit for a day, then make up No. 3 lime, using 1 per cent lime and 1 per cent sulphide. Put in hides and allow to stay a day. Now, make up pit No. 4, using 1 per cent lime, and warm it up to 75 to 80 degrees in the winter and 65 to 75 degrees in the summer. Put in hides for a day. In pit No. 5 put warm water, 75 degrees in summer and 85 degrees in winter. Put in the hides and allow to stay three to five hours. They are then ready to unhair.

UNHAIRING.

They should be unhaired and worked on the grain to remove all fine hair and gurry. They are then put in a wash wheel and washed in running water for ten minutes, when they are ready for the drench. The drenching should be very light—just enough to get the grain soft. A bacterial drench is best to use, as it gives a much softer grain than a chemical or acid drench. When the hides are drenched they are given a light wash in a mill and are then ready to pickle.

With this beamhouse method the second and following packs will

not require as much lime as the first pack. For the second pack use only 1 per cent of lime in the first pit; 1 per cent of lime and one-half of 1 per cent of sulphide in second pit; 1 per cent of lime and one-half of 1 per cent of sulphide in third pit, and one-half of 1 per cent of lime in fourth pit. Clean No. 1 pit every four weeks; No. 2, every three weeks; No. 3, every two weeks, and No. 4, every week. Use clean, warm water every day.

PICKLING.

After the hides are drenched they are trimmed into butts. Make the butts 4 feet 6 inches long and about 4 feet wide. Some hides will cut into a butt 4 feet 6 inches wide. The bellies and heads are tanned in extract and sold for offal. The butts are then pickled in an England (paddle) wheel, using 60 pounds of salt to each 100 gallons of water in the wheel tub; then weigh the butts and for each 100 pounds of butts add to the salt water in the wheel tub 15 pounds of salt and a pint of oil of vitriol. Stir this up well and put in the butts and run the paddle wheel two and one-half to three hours and allow the butts to stay in the pickle liquor over night. This pickle liquor can be used for successive packs until ten packs have been worked through by adding to the pickle liquor 12 pounds of salt and one pint of oil of vitriol for each 100 pounds of butts in each pack.

SINGLE BATH BEST FOR HEAVY LEATHER.

After the butts have been in the pickle the full time, they are removed and placed in piles for 24 hours, when they are ready to tan. The single bath is best for heavy leather, as it is cheap and simple to handle. When the butts have lain 24 hours in the pickle, put them in a drum and make up a liquor containing 5 pounds of concentrated single-bath chrome liquor, 8 pounds of salt, 3 pounds of Glauber's salt and 15 gallons of water to each 100 pounds of butts. Put half of this liquor on the butts and run for one hour, then put in the other half and run another hour.

Take out the butts and pile down over night. The next day make up a liquor, using 10 pounds of concentrated chrome liquor, 12 gallons of water and 5 pounds of salt. Warm to 75 degrees, put in the butts and run 3 hours. Then stop mill for 2 hours and run another hour and allow to stand over night. The next day run the mill three to four hours, when the butts bill be tanned. They are then placed in piles to lay two days, when they are pressed and shaved. When shaved they are put in a mill with a solution of borax, using 2 pounds of borax and 12 gallons of warm water to each 100 pounds of butts. Run in this borax solution for an hour, then put in a wash wheel and

wash in running water for one-half to three-quarters of an hour. They are then ready to fat-liquor.

FAT-LIQUORING.

Make up a fat-liquor by using 1 pound of soft soap (fig soap), 3 pounds of German degras, 2 pounds of neatsfoot oil. Boil an hour, then stir in 2 pounds of moellon degras and add 6 ounces of borax that has been dissolved in a little water. Stir well for at least 10 minutes and add enough water to make 12 gallons. Put the butts in a clean mill and add 15 gallons of water, 160 degrees Fahrenheit, into which has been dissolved 4 ounces of salts of tartar for each 100 pounds of butts. Run the mill for 15 minutes and then drain, then put in the fat-liquor at a temperature of 140 degrees and run mill 45 minutes. Take out the butts and pile down for 24 hours and set them out good and hard. A machine is best for this work. When they have been set out, oil them off on the grain with equal parts of cod oil and paraffin oil.

GET ALL STRETCH OUT OF LEATHER.

Pile down again grain to grain and allow to lie until next day, then hang up until dry. When dry, put them into hot water and allow to lie over night. The next day put in the belt stretchers and stretch very hard and allow to get thoroughly dry before taking from the stretchers. It is very essential to get all of the stretch out of the leather before making up into belts. Be sure and have a mill that is free from acid for fat-liquoring. The tanning mill must be clean, for if there is any vegetable tannin in the mill it will discolor the chrome and make a nasty-looking belt.

These directions carefully followed will make a first-class belting butt.

COLORING AND FINISHING CHROME COW HIDES AND KIPS FOR SPORTING GOODS LEATHER.

To make a brown color, use the following formula: To each 100 pounds of leather, weighed after shaving, run the stock for 15 minutes in 25 gallons of water, 150 degrees Fahrenheit. Dissolve four ounces of alizarine brown G in a pail of water, add to the mill and run 15 minutes. Now dissolve four ounces of alizarine yellow R extra and three-quarters of an ounce alizarine new yellow extra in a pail of water and add to mill and run 15 minutes. Then dissolve one pound of extract of fustic and add to mill and run 15 minutes. Next dissolve

two ounces of bichromate of potash in pail of water and add to mill and run 10 minutes. Then drain the mill and wash the leather in three changes of warm water, when it will be ready to fat-liquor.

If an alkali fat-liquor is used, make it up of one pound of fig soap and three pounds of neatsfoot oil in three gallons of water, and boil 45 minutes; then add three pounds of good moellon degras and stir well. Dissolve four ounces of salts of tartar, add to fat-liquor and stir hard. Fill up barrel to make 12 gallons and put in mill at 150 degrees Fahrenheit. Run mill 40 minutes, take out the leather and dip each piece in a tub of clean hot water and horse up until the next day.

OLIVE GREEN COLOR.

If a dark olive green color is wanted, take the leather from the shaving and for each 100 pounds use 10 gallons of warm water, 100 degrees, and run in mill 15 minutes, then drain the mill. In the meantime, dissolve three pounds of extract of fustic in 12 gallons of water, 110 degrees, add to the mill and run 30 minutes. Now take 12 ounces of copperas which has been dissolved the day before, allowed to settle, and the clear liquor taken off. Add half of it to the mill of leather and run 15 minutes. Then look at the leather. If it is dark enough, drain and wash. If it is not dark enough, add more copperas solution and run fifteen minutes, when it is the color desired. Drain and wash the leather for 20 minutes in four changes of water, when it is ready to fat-liquor same as the brown leather.

If an acid fat-liquor is desired, the following formula will make a very nice article. Be sure and follow directions closely, as it is a very difficult operation to make a good acid fat-liquor. Most tanners fall down in making this kind of a fat-liquor, because they do not take time enough in putting in the oil.

ACID FAT-LIQUOR FORMULA.

Take an earthen jar and place it in a tub containing cool running water. It is quite important to keep the temperature of the oil about 65 degrees. This earthen jar should have a capacity of about 20 to 25 gallons. Now take 30 pounds of neatsfoot oil and 30 pounds of cod oil, put into the earthen jar. Do this is the morning about 7:30. Now take 26¼ fluid ounces of sulphuric acid, 66 degrees, add very slowly and stir well until acid is thoroughly incorporated with oil. It should take about 15 minutes to enter the acid. Allow this to stand until 5 o'clock, when you again add 26¼ ounces as before. Let stand until the next day, when you again add in the morning 26¼ ounces of acid, stirring as before. Allow to stand until evening of

second day, when you again add 26¼ ounces of acid. This makes 105 ounces of acid added all told and is figured on a basis of 1¾ ounces of acid to a pound of oil.

TO OBTAIN DRIER EFFECT ON LEATHER.

If you should wish a drier effect on your stock, you can use a trifle more acid, but never to exceed two ounces to a pound of oil. Next morning the oil is ready to wash, and to do this you get a hogshead or barrel that will hold about 100 gallons of water and put a spigot in it as close as the bottom will allow. Have cask or barrel standing on a small elevation above the floor. Now take the oil that is in the earthen crock and pour it into the barrel. Add about 95 degrees water to this until cask is about half full, stirring well. Now add two three-gallon pails of common salt; stir until barrel is full. Allow this to stand until evening of the third day, when you open the spigot and allow the salt water to run off until oil begins to show. Close spigot and wash as before, using this time only 1½ pails of salt. Allow this to stand over night until the morning of the fourth day. Draw water off and wash again, using this time one pail of salt. Allow to stand until evening. Draw water off and wash as before, using this time again one pail of salt. Allow to stand until morning of fifth day, when you draw the water off for the last time, and the oil that remains in the barrel is ready for use. All you have to do now in fat-liquoring is to take the required amount of oil and dilute it in sufficient water for fat-liquoring.

The main things to look out for in making good acid fat-liquor is to enter the acid slowly and stir well when adding it; also plenty of good stirring when washing it out from the acid. To keep the oil after it has been made you can add a little water to it, say about twice its own weight. Before adding the water, I would advise adding enough concentrated ammonia to the sulphanated oil to neutralize the remaining traces of acid, and to carry it to the alkaline side.

FAT-LIQUORING.

In fat-liquoring chrome leather to be used for colored leather, would advise using about 5 to 5½ per cent actual oil substance, based on the shaved weight. For example, use five pounds of actual oil for every 100 pounds of shaved leather; dilute this in sufficient quantity of 90 to 95 degree water, so that your skins will slush freely in the drum; before putting the skins in the drum be sure that it is thoroughly heated up, so that there will be no traces of congealed oil on the inside. It is also essential to have your skins thoroughly warmed up before giving them the fat-liquor. Run about 40 minutes,

then take out and rinse them off in the tub of clean warm water to eliminate any traces of grease. Then handle as you regularly would. In using this fat-liquor do not oil the skins after fat-liquoring. Do not fat-liquor in the drum that has been used for soap fat-liquor without washing and cleaning drum well with soda or some grease-cutting alkali.

Do not fat-liquor in a tanning drum without cleaning and neutralizing. Do not fat-liquor in a drum used for grease stuffing or vegetable tanning. Warm stock and a warm, clean drum and dilute oil so skins will float freely; this is the secret of success.

FINISHING.

After the leather has been horsed up over night, set it out on the grain side, using a brass or hard rubber slicker, and oil off with a coat of glycerine and water, using one quart of glycerine to three quarts of water. Give the leather a fair coat and hang up to dry. When dry pack in damp sawdust and stake. Be careful in staking so as not to stretch the leather too much in the center of the side, causing a bag to form. When it is staked, hang up to dry. Do not tack it on frames. When dry, restake lightly and then put it in a dry mill with a quart of powdered soapstone to each ten sides, and run mill three to four hours. Take out the leather and brush the grain on a plush wheel to bring up a slight polish and clean off the grain. A plush wheel is just the same as tanner's emery wheel, except that it is faced with plush instead of emery, and runs about half as fast as the emery wheel.

TO MAKE CHROME STORM BOOT GRAIN.

The so-called storm boot grain has proved to be the most popular leather for fall and winter wear ever put on the market. Some tanners make a mistake in using an acid fat-liquor on this kind of leather, for instead of making it water-resisting they make it like a sponge. Acid fat-liquor is all right for sporting leather or glove leather, but it should never be used on leather for winter shoes.

BEAMHOUSE WORK.

To make good storm boot leather the tanner should use a 40-pound plump hide. He cannot get all 40-pound hides, but he should have that weight of hide in mind when he buys hides for that class of leather. The hides should be worked through the beamhouse on a six-day system—two days in the soaks and four days in the lime, using 8 per

cent lime and 1 per cent sulphide of soda in No. 1. The hides should remain in each lime twenty-four hours, then reel them into pit No. 2, using 2 per cent lime; now reel into pit No. 3, using 2 per cent lime and 1 per cent sulphide, when they should be reeled into pit No. 4, using 2 per cent lime. The No. 3 lime should be warmed to 70 degrees Fahrenheit in the summer and 80 degrees in the winter. The lime in No. 4 should be warmed to 75 degrees in the summer and 85 degrees in the winter.

After they have been in the No. 4 lime the required length of time they should be reeled into warm water, 85 degrees in the winter and 75 degrees in the summer and allowed to stay there two hours, when they will be ready to unhair. After they go through the unhairing machine they should be worked over the beam for fine hair, then put in a wash wheel with running water and washed for fifteen minutes.

LIMES SHOULD BE CLEANED.

In using this system of liming the limes should be cleaned as follows: No. 1 pit every four weeks, No. 2 and No. 3 every two weeks, and No. 4 every week. Never clean more than one pit on the same day. When the hides are washed they are ready for the bating, which must be done in a paddle tub to insure uniform results. The material used for bating must have a bacterial action.

If manure is to be used soak two bushels in fifty gallons of water, 120 degrees, for four days, stirring each day, then strain through a coarse burlap cloth, making a bag of the burlap, and put all the solid matter in the bag and hang up over the strained manure liquor to drain for twenty-four hours. This is a great deal of work, but it must be done in order not to stain the hides, for some of them will be made into colored leather, and the hides must be kept clean. There should be about six barrels of this bating liquor on hand all the time, as it improves with age.

BATING.

In making up a bate in the paddle vat a barrel of manure liquor should be put into the vat for each 100 sides to start with; then after the hides have been in the liquor one hour put in another barrel of the manure liquor and run the hides thirty minutes and rest thirty. It will take about two hours to bate the hides, but there is no hard and fast rule. The judgment of the man in charge must be exercised on this point. Use the bate liquor at 70 degrees in the summer and 85 in the winter.

After the first pack is bated about half the amount of manure liquor should be used. This rule depends upon the condition of the manure, which is never uniform, and its action on the hides must be very care-

fully watched. The bacterial bating materials on the market are said to give very good results and are clean, uniform and cheap. After the hides are bated they are put into a wash wheel and washed for ten minutes in running water, when they will be ready for the pickle.

PICKLING.

The pickling should be done in a paddle tub. To start a new pickle dissolve fifty pounds of salt for every 100 gallons of water in the tub, then for each 100 pounds of hide, weighed after bating, use one and one-half pounds of sulphuric acid and eight pounds of salt. Put the hides into the pickle liquor and run the paddle two hours and allow them to rest over night. The next day place them in piles to drain for twenty-four hours, when they will be ready to split. This pickle liquor can be used again by adding to the old liquor one and one-fourth pounds of acid and six pounds of salt for each 100 pounds of hide. After fourteen packs have been pickled run off the old pickle liquor and make up a fresh liquor, using fifty pounds of salt for each 100 gallons of water, same as at the start.

After the hides have lain twenty-four hours they should be pressed and milled in a dry mill for twenty minutes to remove the press marks. They are then split to the required thickness. In splitting stock that is pickled and pressed it should be split the same thickness that the leather is wanted when finished, for it will finish up just about the weight it is split. After splitting the stock can be shaved, or it can be shaved after it is tanned; but shaving after splitting will save the labor of pressing the second time.

TANNING.

The tanning is the next operation and can be done by either the single or two-bath process. About 80 per cent of the side leather is tanned single bath, as it costs less for material and labor. If the two-bath system is to be used the grains are put into a mill with a chrome solution, using five and one-half pounds of bichromate of potash dissolved in five gallons of water by boiling. When dissolved add cold water to make fourteen gallons in all. Put in the sides and run the mill five hours, then horse up the grains and smooth to drain twenty-four hours, then dissolve eighteen pounds of hyposulphite of soda in eight gallons of water and add cold water to cool down and have twelve gallons to each 100 pounds of stock. Put the hides in the mill, placing them on each side of the door, then put in the hypo solution. Now dilute two and one-half pounds of muriatic acid to each 100 pounds of hide by putting it into two gallons of cold water, and use a wooden pail. Put the diluted acid into the mill, taking care not to allow it to come in contact with the hides. Put on the door and start the mill

and run five hours, when the hides should be tanned. Take them out and horse up over night, and they will then be ready to wash.

THE ONE-BATH SYSTEM.

In tanning with the one-bath system the hides are taken from the splitting or shaving and put into a mill with ten gallons of water for each 100 pounds of hide, into which eight pounds of salt has been dissolved. Run the mill fifteen minutes and in the meantime dissolve twelve pounds of concentrated one-bath chrome in three gallons of water for each 100 pounds of hides. When dissolved add cold water to cool down to 100 degrees Fahrenheit. After the hides have run fifteen minutes in the salt solution add half of the tanning solution to the mill and run the mill one hour, then add the remainder of the tanning solution to the mill and run three hours. Take one-half pound of bicarbonate of soda for each 100 pounds of hides and dissolve it in a small amount of water and add to the mill of hides; run the mill an hour longer, when the leather should be tanned. Place a piece cut from the thickest part of the hide in boiling water. If it draws up it is not tanned and should be kept in the tanning liquor until it will stand the boiling water. After it is tanned it should be placed in piles twenty-four hours, when it is ready to wash.

SORTING FOR COLORS.

From this point on the leather is handled the same, whether one-bath or two-bath. It is put into a drum with one pound of borax and 12 gallons of water to each 100 pounds of leather and run one-half hour. The leather is then put into a wash wheel with running water and washed 45 minutes. After it is washed it should be sorted over for colors. All sides with poor grain should be put into black leather; the clear grains can be put into colors. To get a nice red brown, the popular shade, use four ounces of alizarine brown G dissolved in 10 gallons of water by boiling. Add water to cool down to 170 degrees. Have 12 gallons to each 100 pounds of leather. Run 15 minutes in this and in the meantime dissolve four ounces of alizarine yellow R extra and three quarters ounce of alizarine new yellow extra in three gallons of water and add to the mill and run 15 minutes, then drain the mill and the stock is ready to fat-liquor. The amount of dye given here is for 100 pounds of leather.

FAT-LIQUOR.

The fat-liquor is made up as follows: For 100 pounds of leather use one-half pound of good white soap chips and dissolve by boiling.

Add two pounds of olive oil and boil one-half hour longer. Now add seven pounds of good moellon degras and stir well. Cool to 160 degrees, and just before putting in the mill add one-half pint of strong ammonia. Put fat-liquor on stock and run mill one-half hour. Take out stock and horse up over night. The next day set out good and hard and hang up to dry.

Different shades can be made by adding a little blue alizarine or cutting out a little of the yellow. For black, the stock is treated the same as for colors, using one and one-quarter pounds of logwood crystals for each 100 pounds of leather, and three ounces of extract of fustic dissolved and cooled to 130 degrees. Run 20 minutes, then dissolve one ounce of copperas and an ounce of bluestone in a small amount of water and add to the mill and run 10 minutes. Drain the mill and wash the leather in three changes of warm water and fat-liquor same as colors.

When setting the black leather, give the grain a light coat of cod or neatsfoot oil and hang up to dry. When dry the leather is dampened by dipping it into a tank of hot water to dampen through. It is then staked and tacked out to dry. When dry it is staked the second way light and then finished.

FINISH.

The finish is made by dissolving one pound of white soap, one quart of olive oil, four ounces of flaxseed and six ounces of gelatine by boiling one-half hour in one and one-half gallons of water, then add cold water to make three gallons and strain. If the leather to be finished is black, add three ounces of black nigrosine to the finish when boiling. If it is colored leather, do not add any color to the finish. Give the leather a coat of finish and roll while damp, then hang up until dry and roll again. Now grain two ways at right angles.

The splits from these hides are shaved on the flesh side and the thin edges and tag ends trimmed off and the splits are tanned and washed just the same way as the grains. As there is a market for gusset splits the same color as the grains, the splits and grains are colored the same and fat-liquored with an acid fat-liquor, using 6 per cent of the acid oil to 100 pounds of splits, weighed after being tanned.

ACID OIL FORMULA.

The acid oil is made as follows: Take two crocks of 20-gallon capacity and put them into a pit or tub into which cold water can be run so as to keep the crocks cold. Put into each crock six and one-half gallons of neatsfoot oil (best grade). Now pour six fluid ounces of oil of vitriol (sulphuric acid) into each crock very slowly, stirring all the time and for 10 minutes after the acid is in. Allow it

to stand until late in the afternoon and then add six ounces more of the acid, stirring as before, and allow the oil to stand until the next morning, when the third dose of six ounces of acid is put into the oil, stirring the same as before, and allow the oil to stand until late in the afternoon of the second day, when the last six ounces of acid are added, and stir well. Allow to stand until the next day and then take a barrel and put in a spigot an inch from the bottom. Be sure the barrel is clean. Pour in the acid oil. Now dissolve 48 pounds of glaubers' salt in 20 gallons of water 110 degrees and add to the oil and stir hard for 10 minutes and allow to stand until late in the afternoon, when the spigot is opened and the water drained off until the oil appears. Close the spigot and give the oil another dose of glaubers' salt, using the same amount of salt and water. Stir it into the oil well and allow it to stand until the next day, when the water is drawn off. Take 48 pounds of common salt and dissolve in 20 gallons of warm water 110 degrees and stir it into the oil the same way as the glaubers' salt solution was stirred in. Allow to stand until night, then draw off the water and dissolve 20 pounds of common salt in 20 gallons of cold water and add one-half pint of ammonia to the salt water and put it into the oil and stir well. Allow to stand until the next day, when the water can be drawn off and the oil is ready to use. No alkali will be needed to cut this oil.

DRYING.

When fat-liquoring the splits have the amount of water you are going to use at 140 degrees and stir in the oil. Put it in the mill and run the mill for half an hour. Take out the splits and horse up to drain over night. The next day tack them up to dry. Do not try to stretch them—just tack up so they will dry flat. Do not set them. When taking them from the fat-liquor mill it is a good practice to dip them into a tank of hot water to wash off the small particles of leather that will stick to the splits. When the splits are bone dry, they are put into a dry mill and milled for four to five hours to soften. The larger the load in the mill and the faster it is run, the better the results obtained will be. Be sure the splits are perfectly dry, for if they are not they will dry hard when taken from the mill. After they are dry milled they are measured.

TO MANUFACTURE CHROME OIL GRAIN.

This class of leather must be made from good, plump hides, not over 50 pounds, green salted weight. Trim the legs off at the knee, for the part below will not make good leather and there is more money made by selling it for glue stock.

SOAKING.

Soak the hides in clean, cold water 24 hours and mill for half an hour in wash mill, then place back in the same soak they were started in and allow to remain for 24 hours. They are then split into sides and fleshed and put into fresh, cold water over night. Next day make up a sulphide liquor in a pit as follows: Dissolve 200 pounds of sulphide of sodium by boiling in a barrel of water and let stand 24 hours to cool and allow the foreign matter to settle at the bottom. It is a good plan to have a hole three inches from the bottom of the barrel, containing a wooden spigot to draw of the sulphide liquor. This will allow all that settles to remain in the barrel when the liquor is drawn off. Put in the pit as much water as you will need to cover the hides and add enough of the sulphide liquor to bring the water in the pit up to 6 degrees, barkometer measure. Put in the hides and allow them to remain 24 hours, then haul them out. Plunge up the liquor and return the hides, allowing them to remain 24 hours and then haul them out. Plunge the liquor again and return the hides for 24 hours. This will make three days.

WASHING.

Put the hides in a wash mill with running warm water and wash for 30 minutes. The hair should all wash off, but if any remains on the hides, work it off over the beam. When the hair is all off make up a lime liquor, using half a bushel of lime to every 100 sides, and put the unhaired hides in the lime liquor, allowing to remain there for two days, handling each day. They are then ready to wash in the wash wheel 15 minutes in cold water. Rubber gloves must be worn when working sulphide stock, as it will burn the hands and finger nails. The lime is used to remove the sulphide from the hides. It can be washed out by running in a wash mill with running water for 6 to 8 hours, but this washing in the mill is liable to make loose flanks and bellies.

BATING.

After they are washed from the lime they are bated in lactic acid over night. Put the hides in a paddle wheel of water and start the paddle running. Add 2 pounds of 18-degree lactic acid for each 100 pounds of hides and run the paddle for half an hour and allow the hides to remain over night. In the morning run the paddle for half an hour and take them out and wash in a wash wheel for 10 minutes.

THE PICKLE.

They are now ready for the pickle, which is made as follows, in a paddle wheel: To each 100 gallons of water in the paddle tub put in 30 pounds of common salt, then for each 100 pounds of hides add to the salt water in the tub 1½ pounds of sulphuric acid and 12 pounds more of salt. Be sure the salt is all dissolved, then put in the hides and run paddle two hours and allow the hides to remain until the next morning, when they are taken out and piled down 24 hours to drain. It is best to lay them flat on the floor, for if any water except salt water gets on them it will draw out the salt and allow the acid to remain in the hides and burn them. After they are piled down 24 hours they are ready to tan.

TANNING PROCESS.

For the tanning process take a clean paddle wheel and fill it with clean, cold water up as far as the paddle, and for every 100 gallons of water used add 40 pounds of common salt and dissolve. Put in the hides and run paddle for half an hour. In the meantime take 75 pounds of concentrated tan liquor and add warm water, stirring well, until it stands 50 degrees on a Baume scale. When the hides have run for one-half hour in the salt water put in three quarts of the diluted tan liquor in the paddle and run for an hour, then put in two quarts more of the tan liquor and run three hours and allow them to rest two hours. Now run them one hour and allow them to rest in the liquor over night. In the morning run them three hours longer and take out and press them for splitting. When they are pressed, mill them in a dry mill until they are opened up ready to split, then pack them same as for bark splitting and split to the thickness that you desire the finished leather to be. After they are split they are shaved and retanned.

TO RETAN.

To retan, for each 100 pounds of leather, weighed after shaving, dissolve 5 pounds of salt in 10 gallons of water, and put the salt water in a clean mill with the leather and run the mill 10 minutes. Add to the mill of leather two quarts of the 50-degree tan liquor for each 100 pounds of leather and run for an hour. Add another quart of the tan liquor and run the mill two hours, when the hides will be tanned. They are then piled down for 24 hours, when they are put in a mill with 15 gallons of warm water 110 degrees, in which has been dissolved a pound of borax. Run the leather in this for half an hour, then drain mill and wash in three changes of cold water, or put in a wash mill and wash in running water 15 minutes.

BLACKING.

The leather is now ready to black, which is done by dissolving one and a half pounds of logwood crystals in five gallons of water by boiling for each 100 pounds of leather. Add enough water to make ten gallons of the logwood liquor and use at a temperature of 110 degrees. Put the leather in the mill and start running, add the logwood liquor through the gudgeon of the mill and run for fully half an hour. Now dissolve two ounces copperas and one ounce of bluestone for each 100 pounds of leather in a pail of water. Add to mill and run for ten minutes. Drain off the spent liquor and wash the leather in three changes of water to remove the striker, when the leather is ready to stuff.

Put the leather on the press and press hard, then put it in a dry mill and mill it until it is opened up, about one-half hour. Now place it on a table, grain side up, and take a wet sponge and dampen flanks and bellies a little, so they will not take as much grease as the rest of the leather. After the flanks have been dampened heat the stuffing mill as hot as it is possible to heat it, and in the meantime weigh out eight pounds good stearine, six pounds tallow, two pounds German degras and two pounds cod oil for each 100 pounds of leather weighed after it is pressed. Put the stuffing in the kettle and heat to 190 degrees, place the leather in the hot mill and run ten minutes, then add the grease at 190 degrees and run mill forty-five minutes. Take off the door and run ten minutes. Remove the leather and pile it in a box and cover up and allow to lie over night. In the morning set out on the flesh side, and then on the grain side hard and hand up five or six hours. Reset on the grain side and tack out on the tacking frames until dry.

RESETTING.

In resetting it will be necessary to use a setting slush so the leather will stick to the table. A good setting slush for all kinds of sole leather is mac as follows: Three pounds German degras, three quarts No. 2 finishing oil melted together, then dissolve one pound of soap in a gallon of water and stir in the degras and finishing oil. Add enough cold water to make six gallons in all. When the leather is dry on the frames it is taken down and cut over light on the flesh side on the shaving machine, so as to give a clean back, otherwise it will have a greasy back, w' 'ch is very undesirable, as this ass of leather is made into high-cut, unlined shoes. After it is cut over on the flesh it is trimmed and staked light, then boarded from back shank to neck and from front shank to tail. This will make what is called an "English grain." After it is ained this way it is given two coats of finish and hung up until the finish is dry. It is then measured and grained lightly,

just enough pressure being used in the second graining to bring up the grain. The leather is now ready for the sorting table.

SORTING.

The splits can be sorted, the light ones being worked into chrome gusset splits and the heavy ones into bark splits for crimper splits. The heavy ones should be placed in a mill with fifteen gallons of warm water and one pound of borax for every 100 pounds and milled for fifteen minutes. Now run in cold water ten minutes, tack on sticks and work through the bark tanyard the same as rawhides. They will tan faster than raw splits, and if handled right will make a fine crimper split that is very tough. They can be started in an 8 degree bark liquor in a paddle wheel and, when colored good, thrown into a handling yard and tanned out. It has been found most successful to tack them in four days. The light splits are trimmed after they are split and put in a mill with fifteen gallons of water and five pounds of salt for each 100 pounds and run for fifteen minutes. They are then given one gallon of the tan liquor to each 100 pounds of splits weighed after they are trimmed and run three hours. Now dissolve half a pound of borax in a gallon of water to each 100 pounds of splits and add to mill and run for half an hour. They are then taken from the mill and piled down on the floor for twenty-four hours and they are pressed, shaved and blacked as follows:

To each 100 pounds of splits dissolve one and one-half pounds of logwood crystals and four ounces of extract of fustic in fifteen gallons of water. Have the coloring liquor 130 degrees warm and run the splits in the color for twenty minutes. Now dissolve three-quarters of a pound of aniline direct black in three gallons of hot water and add to mill.

FIRST FAT LIQUOR.

Run mill twenty minutes longer and drain mill and give the splits the following fat liquor: For each 100 pounds dissolve one pound of fig soap in five gallons of water, add three pounds German degras and two pounds cod oil. Boil for half an hour and add three ounces salts of tartar. Stir well and add enough cold water to make twelve gallons. Put the fat liquor in the mill at 150 degrees of heat and run the mill 30 minutes. Take out splits and pile down over night to drain. Next day hang up to dry. Do not set them. When they are dry weigh them and for each 100 pounds of dry splits make up another fat liquor.

SECOND FAT LIQUOR.

The second fat liquor is made as follows: One-half pound of soap dissolved in three gallons of water. Add three pounds of moellon

degras, three pounds cod oil and two pounds olive oil and boil hard for half an hour. Cool down to 135 or 140 and add one-half pint of strong ammonia. Have about ten gallons when finished. Take the dry splits and put in fat liquor mill with twenty-five gallons of hot water to each 100 pounds of splits. Have the water about 160 degrees. Run the splits in the hot water for an hour, then drain off the water and put in second fat liquor and run mill for half an hour. The splits are then taken out and piled down over night. Next day hang up to dry and, when they are thoroughly dry, they are dipped in hot water and piled down for twenty-four hours to drain. Then stake and tack out until dry. When dry, restake and they are finished.

FORMULA FOR A GOOD BLACK.

It is a difficult thing to get a good black on splits, but this formula will do it. It is very essential to give the splits the second fat liquor. They will be softer than if they had the full amount of oil at one time. The tan liquor in the paddle tub can be used over again by adding two pounds of borax dissolved in three gallons of water with each pack. With every pack after the first use eight pounds salt to each 100 pounds when starting them in paddle.

MAKING OF GLAZED CHROME CALF.

To make first-class smooth glazed chrome calfskins, the tanner must start in the beamhouse. If he is going to work dry skins he should learn how much water his soaking pits hold, and for every 100 gallons of water the pit contains he should add 4 ounces sulphide of soda. Be sure and thoroughly dissolve all the sulphide before putting it into the water. Put the dry skins into the sulphide water and fill the pit full of skins so it will be necessary to put planks on the top of the pit to force the skins under water. Allow the skins to lay in the soak 48 hours, then take them out and mill in a dry mill for 40 minutes. Now put them back into the old soak for 24 hours. Next pull them out and lay in piles over night; the following day put them in a clean, fresh soak and allow them to stay 24 hours. They are then taken out and trimmed ready for the fleshing machine. It pays to have a man of some intelligence to do this trimming, so as not to waste any of the skin that is fit to tan, also not to allow any unnecessary parts of the skin to go through the works, as it brings up the cost to tan too long shanks and pates and then cut them off at the working table. If green salted skins are to be worked, they should be soaked 24 hours in fresh water, washed in a mill 15 minutes and resoaked 12 hours when they are fleshed. When they are fleshed they are then worked through the limes just the same.

THE LIMES.

The limes are worked as follows: For each 100 pounds skins use 8 pounds of lime and 1 pound sulphide of soda. For the first lime vat use 1½ pounds of lime and ½ pound of sulphide for each 100 pounds of skin. Allow skins to remain in each lime vat 24 hours. Be sure and slack the lime first and then dissolve the sulphide and mix it into the slacked lime. Have five vats in a row.

For the second lime vat make up the lime same as for vat No. 1, and handle from No. 1 vat into No. 2.

For the third lime vat use 2½ pounds of lime for each 100 pounds of skin.

For the fourth lime vat use 2½ pounds of lime to each 100 pounds of skin and warm the lime liquor in No. 4 up to 80 degrees Fahrenheit.

In vat No. 5 have clear warm water and after skins have been in the No. 4 lime 24 hours, warm the water in vat No. 5 to 85 and put in the skins. Allow them to lay therein from 1 to 3 hours, when they will be ready to unhair on a machine or by hand. If the machine is used the skins should be put into warm water and worked over the beam for fine hair. After they are fine-haired they are placed in a wash wheel and washed with running water 20 to 30 minutes. They are now ready for the bate.

BEST MATERIAL FOR BATING.

The best material for bating is something that will give a bacterial action. Manure is about the best, although there are two commercial bates on the market that give very good results and are clean. Manure is the best, its only drawback being that it is so unclean. To use a manure bate, start the manure by putting it to soak in warm water 90 to 100 degrees. Never boil it. Allow it to soak 3 to 4 days, then for every 100 skins, medium size, put one bushel of the soaked manure into the bating paddle. The bating tub should have a box in one corner, long enough to reach to the bottom. This box should be 6 by 8 inches square, with one-inch holes in the sides 4 inches apart, and extending half way to the bottom of tub. This box is for the steam pipe and used for warming the bating liquor. The bating tub and paddle should have a cover so as to retain the heat. Have your skins all ready to bate at least 1 hour before stopping for the night. Warm the bating liquor up to 70 degrees Fahrenheit, and put in the skins. Close the cover and run paddle 40 to 50 minutes, then stop paddle and allow skins to rest in bate all night. In the morning start the paddle and turn on the steam and warm the liquor up to 90 degrees. Run the paddle 1½ hours, when the skins should be bated. The judgment of the man in charge must be used to determine when the skins are bated enough. After they are bated they are washed in warm running water

10 minutes. Before the skins are bated they should be checked on a checking machine. After washing the skins are placed in a slat box and allowed to drain 30 minutes. They are then weighed for the pickle.

PICKLING.

The pickling is done in a paddle wheel and the pickling liquor is made up as follows: For every 100 pounds of skin use 50 pounds of salt and 1¼ pounds of sulphuric acid. This amount of salt is used for the first pack only. For the second pack and all packs following, use 10 pounds of salt and 1¼ pounds of sulphuric acid. Run skins in paddle 2 hours and allow them to lay over night. Horse up in the morning to drain 24 hours. They are then ready to tan. The tanning can be done in different ways: Two-bath, one-bath straight, or one bath with the addition of the alumina and sal soda. You get the best break with the one-bath. However, I will give directions for the different ways and the tanner can be his own judge.

TWO-BATH SYSTEM.

For the two-bath system you dissolve 5 pounds of bichromate of potash (for each 100 pounds of pickled weight) in 3 gallons of water by boiling. Then add enough water to make 10 gallons. To this add 1 pound of sulphuric acid. Put the skins into a mill, placing them up on the sides of the drum so as to allow room for the liquor in the center. Put in the liquor and start the mill. For medium weight skins, say an 8-pound skin, run the drum 3½ hours, then take out skins and horse up smooth to press 24 hours. Use rubber gloves to handle skins out of the chrome, as it is very poisonous and will make the hands very sore. After the skins are horsed the required length of time, dissolve 18 pounds of hyposulphite of soda by boiling in 10 gallons of water, and cool down by adding cold water to make 15 gallons. Put skins into drum same as for chrome bath. Put in the hypo solution and start drum. Before starting drum have 4 pounds of muriatic acid diluted with 2 parts of water ready, and as soon as the mill starts feed the muriatic acid solution to the skins through a funnel with a lead pipe going through the gudgeon. Run the mill four hours after the last of the liquor has been put into the mill, then take them out of drum and horse up over night. They are then ready to wash.

THE ONE-BATH STRAIGHT.

Is tanned as follows: For each 100 pounds of skin, pickled weight, make up 4 gallons of one-bath liquor 23 degrees. Baumé scales. The most practical way for a tanner not familiar with chemicals is to buy

his one-bath liquor. There are commercial one-bath tan liquors on the market that can be bought cheaper than the ordinary tanner can make them, and they are much more uniform. They come in a concentrated extract. All the tanner has to do is to reduce it with warm water until he gets a 23 degree liquor. Put the pickled skins into the mill same as described for the two-bath, then dissolve 10 pounds of salt for each 100 pounds of skins in 12 gallons of water. Put the salt solution in the drum and start mill. Run for 10 minutes to allow the skins to become thoroughly wet, then feed 1 gallon of the tan liquor to the skins through the gudgeon. Allow them to run ½ hour and then feed another gallon and allow them to run ¾ of an hour and give the remaining 2 gallons and run mill 5 hours, when the skins ought to be tanned. If they are not you can allow them to remain in the mill over night. Be sure and try to get all the skins down in the liquor if they are to remain over night. In the morning run the drum 1 hour. Take out skins and horse up smooth for 24 hours, when they are ready to wash.

If you wish to use the addition of the alumina and sal soda, do so as follows: For each 100 pounds of skins dissolve 4 pounds of sulphite of alumina by boiling in 4 gallons of water, then in another tub dissolve 4 pounds of sal soda by boiling in 4 gallons of water. When dissolved pour the soda solution into the alumina solution slowly, then cool down to 80 degrees. Put skins in the mill and put in the combined solution and start mill. Run mill one hour and then drain the spent liquor off and make up a salt solution, using 5 pounds of salt and 10 gallons of water. Put this in on the skins and start mill, then feed into them the tan liquor same as described above. To wash the skins, put them in a wash wheel that has running water and plugs that can be removed so as to allow the water to run off freely. Put in the plugs and add 1 pound of borax for each 100 pounds of skins in 3 gallons of warm water; dissolve and put the borax water into the mill. Put on the door and run mill 30 minutes. Then knock out plugs, take off door, turn on the running water and wash skins for one hour, or until they are free from acid and salt. One and two-bath skins are washed the same. After they are washed, press or put out on putting-out machine so as to put into condition for shaving. When shaved they will be ready to stain and fat-liquor.

STAINING.

To stain, dissolve 1½ pounds of good logwood crystals for each 100 pounds of skins, shaved weight. Heat 10 gallons of water to 180 or 190 degrees and stir in the crystals; then put in 4 ounces of fustic paste and stir well. Now put skins in mill and put 10 gallons of warm water

in mill and run mill 15 minutes. Cool the logwood liquor down to 125 degrees and put it on the skins. Run the mill one-half hour, then dissolve 2 ounces of copperas and one-half ounce of bluestone in 3 gallons of water and put the strike liquor in the mill. Run mill 10 minutes and knock out plug and drain mill. Then work for 15 minutes, using plenty of lukewarm water in washing. They are then ready for the fat-liquor, which should be made up and ready for use.

FAT-LIQUOR.

Make the fat-liquor as follows: For each 100 pounds of skins dissolve one-half pound of fig or olive soap by boiling in 3 gallons of water. When dissolved add 2 pounds of good neatsfoot or cod oil and boil one-half hour; then cool down to 185 degrees and stir in 2 pounds of good moellen degras or 2 pounds of olive oil and stir well. Then dissolve 3 ounces of borax in a quart of water and add to the fat-liquor. Stir it well and it is ready for use. Put the fat-liquor in the mill with the skins and run 30 minutes, then take out the skins and horse up for 12 hours. They are then ready to set out. Oil off and hang up and dry. When oiling off use 1 part olive and 3 parts paraffine oil. Do not touch the flanks when oiling off. Do not dry too fast. It should take about 36 hours to dry the skins. When dry they are ready for the damping, which is done by having a large tank two-thirds full of warm water, 125 to 130 degrees. Take 6 skins at a time and dip them in the tub. Hold them under the water about 2 minutes, then place them in a pile, and when you have a pile of 50 skins cover over with damp sawdust and allow them to lay at least 14 hours; 18 hours would be better. They are taken from the piles and staked on a Slocum staking machine. Do not stake the flanks too hard. After they are staked they are tacked out on tacking frames until dry.

SEASONING.

They are then trimmed and given the first coat of seasoning, which is made as follows: One pound of ivory soap dissolved in 8 gallons of water; 1 pound of glue frozen dissolved in 8 gallons of water. When dissolved add soap solution to glue solution; then dissolve 8 ounces of logwood crystals, 8 ounces nigrosine B, 1 ounce bichromate of potash in 8 gallons of water by boiling. When thoroughly dissolved cool down to 100 degrees and add 8 quarts of fresh beef blood. Stir well and put in 4 ounces carbolic acid. Use 1 quart of the glue and soap solution with 2 gallons of the blood solution. After the skins have had the first coat and are dry glaze them, and if they are for smooth glaze calf they should be staked and then given another coat of seasoning. When dry, glaze and they are then ready to measure and oil off with

hot finishing oil. If they are for boarded calf they should not be staked the second time. Just give a second coat of seasoning, dry and glaze; then board and after boarding they are measured and oiled off and the last thing is to roll them on a rolling jack, using light pressure.

CHROME WAX CALF.

During the process of making chrome calf and kip there will be found many skins that are imperfect on the grain. These skins can be worked into chrome wax if they are not too light, and sold at a better profit than if finished into regular chrome leather and sold as a job lot. The way to do this is to work them through the beamhouse and tannery with the regular work and send them to the shaving machine. When they are shaved sort them out and wash them just the same as all chrome skins are washed, then tack them on to sticks and hang into a 5-degree hemlock liquor for twenty-four hours, then give them an 8-degree liquor for forty-eight hours and a 10-degree liquor for forty-eight hours. They are then taken from the sticks and put into a 14-degree liquor for six days. Handle every two days, or give them a 16-degree liquor for four days and handle every two days, then give them five days in an 18-degree liquor, handling every other day. They are then full tanned.

IN HANDLING THE SKINS

through the tan yard, take from the vats and put them out in a pile and allow them to lay from four to six hours. After they are tanned let them lay in the pile forty-eight hours. They are then ready to go to the currying shop.

In the currying shop the first thing to do is to give them a good fat-liquoring as follows: For each dozen of medium-sized skins dissolve a half pound of good soap by boiling in twelve gallons of water. When thoroughly dissolved turn off the steam and stir into the soap solution four pounds of moellon degras. Use the fat-liquor at 125 degrees Fahrenheit, and run skins in fat-liquor for half an hour, and lay in a pile over night. The next day press and hang up to sammy for stuffing. The judgment of the operator must determine when the skins are in the proper condition for stuffing. Always dampen the flanks a little more than the body of the skins, as the flanks are the most open part of the skin and will absorb more grease than the rest of the skin and cause the flanks to be coarse. The amount of grease to be used must also depend upon the judgment of the operator. The stuffing is composed of stearine, hard grease and fish or cod oil. Chrome wax will not carry as much grease as vege-

table tanned wax calf. The stuffing should be used at a temperature of 140 degrees.

After the skins are taken from the mill they should be piled down over night into a box and covered up so as to keep warm. They are then set on the flesh side, with a slicker and then with a stone, and hang them up by the hind shanks until partly dry. Now reset on the grain side. When they are dry they are piled down nice and smooth for six days, when they will be ready to whiten. It is much better to whiten by hand.

After they are whitened they are grained, breaking the grain left front shank to right hind shank, and vice versa. They are then ready to blacken with the following soap black:

BLACKING.

Take 8 gallons of water and dissolve in it 1½ pounds of logwood crystals, then add one-half ounce of bichromate of potash and stir well. Next add 5 pounds of good tallow soap and one-half pound of caustic potash and boil for 2 hours, then add 5 pounds of good gas lampblack and boil for 3 hours. There should be 20 gallons when finished. This soap black must be stirred 15 minutes every 3 hours, until thoroughly cold, when it is ready to use. The blacking can be put on by machine and better results are obtained by giving the skins one coat and glossing them; give another coat and gloss again. After the second glossing they are ready for the paste, which is made as follows:

THE PASTE.

Mix 2½ pounds of flour into a thin batter. Start by using a small amount of water so as to get all the lumps worked out; keep adding water until there is a thin batter. Now add to the batter one-half pound of soap cut into small pieces and one-quarter pound of frozen glue that has previously been soaked over night in a quart of cold water, 2 ounces of black nigrosine and 1 pint of cod oil. Boil this combination half an hour and allow to cool over night. In the morning add sufficient water to make it thin enough to feed through the machine. Give the skins a light coat of this paste and hang up until almost dry, then take them down and gloss on the glossing jack and hang up over night, as it is very important that the paste be absolutely dry before the finish is put on.

THE FINISH

is made up as follows: Soak 1 pound of frozen glue 24 hours in 3 quarts of cold water, then add to the soaked glue one-half pound of

Ivory soap, 2 ounces beeswax cut into small pieces, 1½ pounds of good white tallow, 4 ounces nigrosine black, and boil the mixture 20 minutes and allow to stand 24 hours undisturbed. Now add very carefully 14 quarts of cold water, adding the water slowly and stirring all the time. When all the water is thoroughly mixed in, the finish is ready for use. This finish will give the skins a fine mellow feel and should be put on by hand, using a sponge. Give them a good coat and hang up to dry. When thoroughly dry they are ready to trim and measure. If these directions are carefully followed, the best of results will be obtained, as this is the process used by the most successful tanner in Germany.

CHROME GRAIN LEATHER AND GUSSET SPLITS.

The call for heavy chrome leather is growing every day. The old-time bark-tanned oil grain and so-called kangaroo leather has had its run and is now numbered among the "has-beens." Chrome grains are the most suitable from every point for the everyday shoe. They wear longer, stand much abuse and never grow hard, and since the chrome waterproof sole leather has proved successful a shoe can now be purchased which is the acme of success.

GOOD, PLUMP HIDES NEEDED.

To make a first-class chrome grain leather the tanner must start in the hide house. He must select good, plump hides not over 50 pounds. A 50-pound spready hide will not make a first-class article. When the hides are selected trim off the heads and shanks and put them (the hides) in a soak of clean, soft water. If the water is hard, soften it with a little borax, say 5 pounds to 1,000 gallons of water. String in the hides. Do not throw them in the water and expect to get uniform results. Have hooks in the soaking pit and hang the hides in from tail to head and allow them to hang twenty-four hours, then take them out or run off the water and fill up with fresh water and allow them to remain twenty-four hours longer.

Take out the hides and split them into sides, being careful to keep the backs straight. After they are split into sides, flesh and run off all strings of flesh hanging on the edges, as these strings of flesh contain a large amount of grease and sometimes cause trouble in the limes. After they are fleshed, put them into clean, cold water over night and the next day toggle them together ready for the lime.

LIMING.

To lime for this class of leather, 8 per cent of lime and 1 per cent of sulphide are used as follows: The first day slack 1½ per cent

of lime to the weight of hides as they come from the hide house. Add the slacked lime to the first pit and plunge it well. Then reel in the hides and use enough care so that they go in the pit spread out. Do not allow them to go in and lie in a bunch. A man standing on the opposite side of the pit from the reel can work them in with a hook.

Allow them to lie in the lime for twenty-four hours, then make up into pit No. 2 a lime containing 1½ per cent of lime slacked and plunged well. Reel the hides from pit No. 1 into No. 2 and allow to remain twenty-four hours, then make up lime in pit No. 3 in the same manner, using same amount of lime, and reel from pit No. 2 into pit No. 3 and allow to lie twenty-four hours longer. Now make up lime in pit No. 4 and reel from No. 3 into No. 4 and let lie another twenty-four hours. Make up a lime in pit No. 5, and in the winter time, if the water is below 60 degrees, warm it up to 60 degrees and reel from No. 4 into No. 5. Make up a lime in pit No. 6, using 1 per cent of lime and 1 per cent of sulphide. Dissolve the sulphide and add it to the slacked lime, mixing well. Warm the lime solution in pit No. 6 to 75 degrees and reel in the hides and allow to lie twenty-hour hours, when they are reeled into warm water 80 degrees, and after lying in the warm water two or three hours they are ready to unhair.

In pits Nos. 3 and 4 use 1½ per cent of lime, in pit No. 5, 1 per cent of lime, and in pit No. 6 use 1 per cent lime and 1 per cent sulphide. The reason for using less lime in No. 5 is because the hides take a large amount of the lime from pits No. 1 to No. 4 into No. 5. We use the sulphide in No. 6 so as to help remove the fine hair, as it is very essential that all the fine hair in grain finished leather be gotten out. The sulphide is also used because pit No. 6 is cleaned out every week, in order to have the hides unhair out of a new lime, which gives a hard, plump hide from the lime. Limes Nos. 2, 3, 4 and 5 are cleaned out every fourteen days, but do not clean two limes on the same day. Clean No. 1 lime every four weeks, which enables us to start the hides in an old lime and finish out of a new one.

REELING HIDES ECONOMICAL.

The reeling of the hides is a very economical way of handling, but the important reason is that it changes the position of the hides so that the ones on the bottom of pit No. 1 are on the top in No. 2, and vice versa, through the entire liming operation. Hides that are pulled out by hand go into all the pits in the same position as in No. 1, for the first hides out are piled on the floor and the last hide lands on the top of the pile and is the first hide to go into the next pit. With all the hides on top it is impossible to get uniform liming.

We have an overhead track from the hidehouse to the beamhouse and a track scale, so we can weigh each day's work as it comes from the hidehouse, and know just the amount of lime and sulphide to use each day, without any guesswork, which is a very costly thing in a chrome tannery. After the hides are unhaired they are washed for fifteen minutes in a wash wheel with running water and then placed into warm water 80 degrees, after which they are worked by hand over the beam, when they are ready for the bate.

BATING.

The bating is done in a covered paddle wheel with a bacterial bate. Bate the hides during the day so as to pull them out when they are ready. This kind of leather does not want to be bated as low as chrome leather for japanning. When the hides feel mellow they should be taken from the bate and washed for ten minutes in a slush wheel with running water. They are then ready for the pickle.

PICKLING.

The pickling is done in a paddle reel, using 1½ pounds of sulphuric acid and 10 pounds of salt to each 100 pounds of hides as they come from the bate. In making up a new pickle get the amount of water the paddle tub holds, then for every 100 gallons of water put in thirty pounds of salt, then add the amount of salt and acid mentioned. Run the paddle reel from one and one-half to two hours and allow the hides to remain in the pickle tub over night. The next day remove and horse up, or pile down to press for twenty-four hours. They are then ready to tan in pin mills as follows:

For each 100 pounds of hides, weighed after lying in the pickle twenty-four hours, make up a salt solution consisting of 10 gallons of water and 8 pounds of salt. Put the hides in the drum with this salt solution and run the drum fifteen minutes. In the meantime take 10 pounds of concentrated one-bath tan liquor and dissolve it in 6 gallons of warm water. When the mill has run fifteen minutes add to it one-half of the tanning liquor and run one hour, then add the other half of the tanning liquor and run the mill six hours. If the leather gets over 95 degrees in running, add some cold water to the drum to cool it down. After the mill has run the required length of time take out the hides and place in piles over night.

SPLITTING.

The next day either press or run the leather through a wringer to put in condition for splitting. If it is pressed take it from the

press and dry-mill it for 15 minutes and it will be ready to split. Six-ounce is the usual weight to split this leather. After splitting the leather is shaved and then the grains are put into a mill with 15 gallons of warm water for each 100 pounds of leather weighed from the shaving machine. Run the leather in the warm water fifteen to twenty minutes, then dissolve 4 pounds of concentrated one-bath tan liquor and add it to the leather and run the mill two hours. The leather should be thoroughly tanned, but if it is not, keep it in the mill until it will stand the boiling test. When it is tanned, pile it down for forty-eight hours, then put it in a mill with 12 gallons of water 95 degrees and one-half pound of borax for each 100 pounds of leather and run the mill for half an hour. Wash in running water another half hour, when it is ready to be colored.

COLORING.

If it is for black grains dissolve 1½ pounds logwood crystals for each 100 pounds of leather in 12 gallons of water and add 3 ounces of borax to the logwood. Run the leather in this dye-bath for half an hour, then dissolve 1 ounce of bichromate of potash in a gallon of water and cool down by adding cold water to make 3 gallons. Put in the chrome water and run 15 minutes; then drain the mill and wash the leather in three changes of warm water, or fifteen minutes with running warm water.

In the meantime have a fat-liquor made up of the following materials: One pound of fig soap, 3 pounds of German degras, 3 pounds neatsfoot oil, 2 gallons of water and boil three-quarters of an hour, then add 3 pounds moellon degras or cod oil and stir well. Now dissolve 4 ounces borax and add to the fat-liquor and stir well. Fill up to make 12 gallons and have at a temperature of 140. Put this fat-liquor in the mill and run forty minutes, when the fat-liquor should be all taken up. If it is not, put into the mill about 4 ounces of salts of tartar dissolved in 3 gallons of warm water, 160 degrees, and run the mill fifteen minutes longer. Take out the leather and horse it up smooth to drain over night.

The next day set out hard on the grain side and oil off with a good coat of cod oil or neatsfoot oil and hang it up to dry. Place it in piles to mill for from seven to ten days, then pack it down in damp sawdust for twelve hours, when it is ready to stake.

In staking this leather care should be used to stake the shanks and necks crosswise, and not lengthwise. After the leather is staked it is tacked out on frames. The tacker must be careful to keep the backs straight. When the leather is thoroughly dry it is removed from the frames and trimmed and given a seasoning made as follows:

SEASONING.

Cut a half pound of white soap into small pieces and put into a gallon of hot water. Add to this 1 pound of caseine, 4 ounces black nigrosine and boil for half hour, then add cold water to make 3 gallons. Give the leather one coat of this and when it is struck in mill with a high pressure and hang up until perfectly dry, then grain from front shank to tail and from neck to back shank, when it is ready to be measured. If a greasy feel is wanted on the leather when finished make up the following finish:

FINISHING.

Four ounces Irish moss, half pound olive green soap, 1 pint of neatsfoot oil, 4 ounces nigrosine black and boil half hour in 2 gallons of water, then cool down by adding cold water to make 3 gallons and strain. After the leather is grained give it a coat of this moss finish and hang up to dry. When dry it is measured and sorted. It is very essential to give the leather a coat of finish and roll while damp, as this causes the grain to lay down and gives a much more uniform break when graining.

TO MAKE COLORED LEATHER.

If colored leather is to be made, the leather is taken from the wash mill and given a mordant of 6 pounds of gambier dissolved by boiling in 3 gallons of water, then cooled down by adding cold water to make 10 gallons. Run the leather in this mordant solution forty minutes and drain the mill. Now have a fat-liquor made up as follows: Three pounds of olive oil, 1 pound of fig soap and boil for half hour, then add 5 pounds of moellon degras and stir well. Just before putting the fat-liquor into the mill add half pint of ammonia and stir well. Have the fat-liquor 140 degrees, run in fat-liquor forty minutes and take out and horse up over night. The next day set out and hang up to dry. When dry put back into mill and run in hot water until thoroughly wet, then drain the mill and add the dye used for coloring and run thirty minutes in the dye. Be sure and use plenty of water with the dye, so as to get a uniform color. When the leather is colored, allow it to be horsed up for twenty-four hours before setting it. When setting, oil off the grain with a light coat of oil and hang up to dry. When dry, damp and stake same as for blacks.

The same seasoning that is used on the blacks can be used on the colors by leaving out the nigrosine. The amount of gambier and fat-liquor mentioned is for each 100 pounds of leather weighed after shaving.

GUSSET SPLITS.

The splits made from this leather are usually made into gusset splits. They are leveled up on the splits machine. The leveling is taken from the split side and the splits are then shaved so as to remove any flesh that may be on them. They are then put into a mill and milled for fifteen minutes in 12 gallons of hot water, then put in 4 pounds of concentrated chrome liquor which has been dissolved in a gallon of hot water. Run the splits in this retanning liquor three to four hours, and half an hour before taking from the mill dissolve half a pound of salts of tartar in a gallon of water and add to the mill, then take out the splits and allow them to lay in a pile for forty-eight hours. They are then ready to wash, which is done by running them in a borax solution for half an hour, using a pound of borax and 12 gallons of warm water, then half an hour in cold running water.

Now put the splits in the cold drum and for each 100 pounds dissolve 1½ pounds of logwood crystals and 4 ounces extract of fustic in 12 gallons of water. Have the logwood liquor 130 degrees and run splits in it for half an hour, then take 12 ounces of direct black and dissolve it in 2 gallons of water. Add to mill of splits and run fifteen minutes. Now take 3 ounces of copperas and dissolve in pail of water and add to mill of splits and run 10 minutes. Now pull plug and drain mill and wash splits twenty minutes with warm water, changing the water three times. They are then ready to fat-liquor as follows:

FAT-LIQUOR.

Four pounds moellon degras, half pound fig soap and boil fifteen to twenty minutes. Cool down to 140, then add half pint of ammonia and run splits in fat-liquor half hour. Take out and allow to drain over night and hang up to dry. When dry put back into fat-liquor, mill and run in hot water 140 degrees for three-quarters of an hour, using enough to make the splits soaking wet. Now run off the surplus water and make a second fat-liquor as follows: Two pounds neatsfoot oil, half pound soap and 2 pounds moellon degras. Boil half hour, then add 3 ounces of salts of tartar dissolved in two quarts of water. Stir well and add to splits at 140 degrees and run half hour. Take out the splits and drain over night and hang up to dry. When dry put them into a mill and put in a little warm water and run mill two hours, so as to just dampen the splits. Now tack them out to dry and when dry they are put in the mill again and dry milled from two to three hours, or until they are soft. They are then ready to measure.

Some tanners do not tack them. They take them after the second drying and mill them two or three hours and then run them through the staking machine lightly to get out the bag and then measure them.

CHROME CALFSKINS FOR COLORS.

In making chrome-tanned calfskins for the so-called chrome Russia, it is necessary to start with green-salted skins if a first-class article is desired, says a practical man. They should not be any larger than 7 to 9 pounds; 5 to 7 pounds would be better. To try to make this class of leather from dry skins alone is a sure way to meet with failure. I do not mean to imply that chrome Russia cannot be made from dry skins, but over 16 per cent cannot be gotten from dry skins that will be fit to put into colors, that is, colors which will bring a profit that will pay for all the trouble and expense it requires to make good colors. If you have a trade established on colors that are made from green skins, you can work dry skins, and the best you can expect will be about 16 per cent of the drys, which can be worked in along with the green skins.

FOR COLORING.

When working No. 1 green skins, 75 per cent is a fair average that will be fit for colors. When making colors, great care must be exercised in working the skins from the very start. They should be soaked for 24 hours in clean soft water if possible. If the water is hard one-half pound of sulphide of soda to each 100 gallons of water in the soaks will soften it sufficiently for soaking either green or dry skins. Dry skins require at least four day's soaking, with a good milling after the second day, then follow the milling with two days' more soaking and after that they should be handled just the same as green skins. After soaking the required length of time the skins should be washed with running cold water for 15 minutes. This washing will remove all the salt and filth which would otherwise be carried into the limes and in a short time produce a foul lime. After washing the skins are put into a clean soak another day and then fleshed. (When a day is mentioned it means a day and a night). Very little flesh will come from dry skins, but the work is necessary on them, as it breaks up the flesh and will allow the lime to do its work uniformly.

LIMING FOR COLORS.

When liming skins for colors, or even blacks, a six-day system is best. It can be done in four days, but six are better. The following system will work very satisfactorily unless the water is extremely

hard, when it will be necessary to modify it to suit the conditions of the water. Use 8 per cent lime and 2 per cent of sulphide, taking the salted weight for a basis. Do not work the packs too large. Have plenty of room in the pits so the skins will not be crowded.

The first day use 2 per cent of lime. Second day haul the skins and give them 1½ per cent of lime, 1 per cent of sulphide. Third day haul the pack, plunge the lime and use 1½ per cent of lime. Plunge the liquor after putting in the lime. Fourth day use 1½ per cent of lime and 1 per cent sulphide. Fifth day use 1½ per cent of lime and warm the lime liquor to 70 degrees. Sixth day haul the pack, and if necessary, warm the lime to 70 degrees. On the seventh day put the skins into clean, warm water, 80 degrees, for at least 1 hour, then start to unhair them.

After unhairing they should be cheeked or head split and then scudded or worked over the beam. A tub or tank large enough to hold 200 gallons should be placed back of the beam hands and filled with warm water 80 degrees. Put in 15 to 20 skins at a time and have them worked on the beam from the warm water. The warm water will be of great assistance in getting out the gury from the grain, which is very necessary when working colors.

After they are scudded they should be placed in a wash mill with running water and washed 15 minutes. The water should be about 65 or 70 degrees. If it is cold it will cause the skin to contract and prevent the dirt and lime from coming out of the skins. After the skins are washed they are ready for the bate.

When using this system of beamhouse work, half of the lime should be run off after each pack goes through, and in the summer time the entire lime should be cleaned out after every fourth pack has been worked through; in the winter time after every sixth pack. The running off of half of the lime and the cleaning out of the entire lime liquor after the fourth and sixth pack is necessary only when one pit is used to do the liming in. Where a series of five pits is used, one of the pits should be cleaned thoroughly each week, starting with pit No. 1, and taking the pits in rotation. In this way the skins always have the benefit of an old lime.

It is a very good plan to spot the skins just before they go to the unhairing machine. By "spotting" is meant to take the white hair off by hand so as to keep it separate from the colored hair. White hair will bring 16 cents to 20 cents a pound, and where 100 dozen skins per day are being tanned, the white hair account shows a nice balance on the ledger.

BATING.

After the skins are washed and are ready for the bate they should be put into cold water over night. Do not allow them to lay in piles on the floor. A good rule to follow is to keep the skins under water.

Do not allow the air to strike them any more than is absolutely necessary from the time they go into the soaks until they are tanned.

The bating is a very particular part of the process. It must be done in the daytime to assure success. The bating material must be of a bacterial action, either manure or one of the commercial bacterial bates that are advertised in Hide and Leather. Do not try to bate the skins too fast. Much better results are obtained by using a weak, slow acting bating liquor than a strong, rapid bate. Do not run two packs of skins through one bating tub in one day. Bating liquor requires time to rest and recuperate. If you are running packs of a uniform size you can tell in advance the right amount of bating material to use and you will find much better results will be obtained by putting the bating material in the bate liquor right after removing the bated pack and allowing it to form an affinity with the bating liquor.

If a manure bating material is used, great care must be exercised to soak it thoroughly and strain it carefully, so as to guard against staining the skin. If the commercial bate is used, the bated skins will be clean and white, as there is no dirt or filth of any description in them. Skins for colors must receive a very low bating so as to allow them to "open up;" in other words, to be flat and soft. If skins are not bated low there will be mottled bellies and flanks. They will look as if there was an old grain in them, but they will be smooth. This mottled appearance is not so noticeable in blacks, but in colors it puts all such skins in a lower grade. After the skins have received a proper bating they should be washed in running warm water, 70 degrees, for 10 minutes at least, when they will be ready for the pickle.

PICKLING.

The pickling is usually done in a paddle tub and the pickle liquor is used for 18 to 30 packs before it is run off. With this system it is impossible to keep control of the pickle liquor, as there is no accurate way of telling just how much acid and salt an old pickle liquor contains, not to mention the amount of foreign matter that will accumulate. There are a number of tanners who are either pickling in a drum or making up a new pickle for each pack pickled in the paddle tub. To pickle in a pinmill drum use 1½ pounds of acid, 10 pounds of salt and 15 gallons of water for each 100 pounds of skins. Run the skins in the pickle 3 hours, then horse them up to drain 24 hours. If the pickling is done in a paddle tub, three-quarters of a pound of salt for each gallon of water and 2 pounds of acid for each 100 pounds of skins is used. Weigh the skins after washing from the bate to get the weights for pickling. Run the skins in the paddle tub pickle 3 hours and allow them to rest in the liquor over night. The next morning place them on horses smoothly to press, and drain 24 hours, when they will be ready to tan. If the pickle liquor is to be used over and over again

for successive packs it should be made up for each pack after the first by using 10 pounds of salt and 1½ per cent of acid. The pickle liquor should be run off every three weeks and a new one started.

TANNING.

The tanning can be done in a drum or paddle wheel. The drum system is used more extensively than the paddle system, although some of the best tanners use the paddle wheel. In tanning for colors, or in fact, any chrome leather, the one-bath tannage is considered the best, as it has no sulphur in it to cause the colors to fade. There are a number of formulas for making a one-bath tannage, but unless a tanner has a thorough knowledge of chemistry or has a business large enough to pay to hire a chemist he will be in a safer position by using one of the commercial tannages that are on the market, as the firms that manufacture these tannages are reliable and thoroughly understand the chemical end of the tanning business. There are few tanners who are chemists.

After the skins are drained 24 hours they are put in a mill with a salt solution made up by using 8 to 10 pounds of salt and 12 gallons of water for each 100 pounds of skins weighed after they have drained. Run the skins in the salt solution 15 minutes, then start tanning. Do not expect to get the skins tanned in three or four hours and have good leather. It is much better to give them plenty of time, and time is the least expensive thing around a tannery. After the skins are thoroughly tanned they should be horsed up to press and drain for 24 hours. They are then ready to run through a putting-out machine, or press and shave. After they are shaved they are sorted for colors, and the skins that will make colors are marked and washed. The washing should be done in a drum with running water and plug holes, with plugs in same. Put the skins in the mill and make up a borax solution by using 2 pounds of borax and 12 gallons of water for each 100 pounds of skins. Run the skins in the borax solution one-half hour, then take out the plugs, turn on the running water and wash the skins for an hour, if there is a generous supply of water. If there is a light supply of water wash them longer. They must be absolutely free of acid before being taken from the wash wheel. After washing they should be allowed to drain for four hours; over night is better.

MORDANT.

After they have drained give them a bottom or mordant made as follows: For 400 pounds of skins use 8 pounds of sumac extract and 1½ pounds of acid brown dye, No. 86. Dissolve the sumac in hot water,

[illegible] water to make [illegible] gallons. Have the liquid at a temperature of [illegible] degrees Fahrenheit. Run the skins in this solution for [illegible] hours in a mixture of [illegible] ounces of potassium bichromate dissolved in two gallons of water. Run the skins for [illegible] minutes and drain them. Wash the skins in two changes of warm water, [illegible] degrees temperature, which they will be ready to receive the tanning liquor. This tanning is performed with the skins not sufficient to receive any of the chrome in the tanner. The tanning should be done with a basic [illegible] to make the solution red brown shade. Use [illegible] ounces of phosphate [illegible] ounces of lime, [illegible] ounces of Havana brown, for 400 pounds of tanner. Run the skins in the [illegible] half hour, then drain off the tanning liquor and re-liquor.

RE-LIQUORING.

To re-liquor add pounds of leather use [illegible] pounds of salted egg yolk and [illegible] pounds of best grade of neatsfoot oil. Heat the oil into the egg yolk thoroughly then add water to make [illegible] gallons in all and use at a temperature of [illegible] degrees Fahrenheit, and run the skins in the re-liquor one-half hour. Have a clean tub of warm water, and add to the clean warm water enough acetic acid so it will taste sour. As the skins are taken from the re-liquor pass them through the acid water to clean them and brighten up the color. After passing through the acid water drive them up smooth, grain to grain, to press over night. The next day set them out by hand to grain with a brass or rubber roller and hang up to dry.

In making up the acid use [illegible] to 2 ounces of acetic water for each 10 gallons of water. There should be at least 15 gallons of water for each 100 pounds of leather. Make up a new acid bath for each pack of skins re-liquored. When the skins are dry they are either dipped in warm water and packed down over night, or packed in clean, damp sawdust over night. In the morning they are staked or tacked to boards to dry. When dry they are given a seasoning, made by boiling a pound of flaxseed in 2 gallons of water one-half hour, then allow it to stand until cool. When it is cool strain and add water to make three gallons, also a pint of glycerine. Take the skins from the boards and trim them, give a coat of the seasoning and hang up to dry. When dry run them on a plush wheel to bring up a face, then give them a light staking and roll with a light pressure. They are then ready for sorting and measuring. There are always a lot of skins that have poor grains which can be worked into ooze calf. To make good ooze a skin must be free from butcher or slaughter cuts and have full skirts. After they are tanned they should be washed and shaved. The shaving must be perfect.

After they are shaved they are put into a clean drum and given a run in very finely powdered pumice stone, using a quart of pumice to each 100 pounds of skins. Run them for half an hour in the pumice. They are then ready to cut over on the flesh side on a wet wheel. The operation of wet-wheeling is quite a particular one, as the skirts and heads, which have a long fiber, must be cut down so they will be as fine as the body of the skin. The pumice is milled into the skin to facilitate the work of the wet-wheel. After the wet-wheeling the skins must be washed in running water to remove all traces of the pumice stone.

After this washing, if they are for colors, they are given a mordant the same as for the grain colors, and then colored and fat-liquored in the same way and hung up to dry. They are set out on the flesh side. After they are dry they are finished the same way as the blacks. If the ooze skins are for blacks they are taken from the wash wheel and given a run of one-half hour in the following solution: For 100 pounds of skins dissolve 3 ounces of permanganate of potash crystals, a pound of logwood crystals in 10 gallons of water. Use at a temperature of 110 degrees. Now dissolve 1½ pounds of either regal or raven black in 3 gallons of water and add it to the mill and run 20 minutes. Now drain the mill and give the leather a run of 10 minutes in a solution of acetic acid, using 2 ounces in 10 gallons of water for each 100 pounds, then drain and wash with three changes of warm water. They are now ready for the fat-liquor.

FAT-LIQUOR.

The fat-liquor is made up by dissolving one-half pound of olive oil soap in three gallons of water. When dissolved add two pounds of neatsfoot oil and a pound of moellon degras and boil for half an hour. Now add water to make 10 gallons, then dissolve 3 ounces carbonate of potash in a small amount of water. Add it to the fat-liquor and stir hard. Use the fat-liquor at a temperature of 140 degrees Fahrenheit. Run the skins in the fat-liquor for 40 minutes. Take them out and horse them up to drain over night, then set out and give a light coat of oil on the grain side only. Be careful to keep the oil from the flesh side. When dry they are dampened and staked and then hung up until almost dry. They are then put into a dry wheel and run 3 to 5 hours, when they are tacked out to dry. When dry they are given a light staking and then a run on a plush wheel on the flesh side. They are now trimmed and measured.

The skins that were colored for ooze are treated to the same process as the black skins when they are dry. Some tanners of colored ooze give them a coat of oil on the grain side when setting out, but it must be a light coat, or it will leave the skin spotted on the flesh side.

CHROME SOLE LEATHER

An expert writes: Many tanners may be deterred from attempting to make chrome sole leather under the belief that it is a slow, expensive and difficult operation. This article is written partly to assure such tanners that, directly to the contrary, a sample lot of chrome sole leather can be made quickly, inexpensively and well, and partly because many tanners who are engaged in manufacturing chrome sole may pick up some useful pointers. If anyone engaged in the tanning industry will follow the directions given below, I think he will make as good chrome sole leather as is being made in this country today. And please do not forget that this country leads the world in the manufacture and use of chrome sole leather. The above refers to both kinds of chrome sole, the "waterproof" for everyday shoes, and the sporting shoe chrome leather.

PLUMP HIDES NECESSARY.

Select the plumpest hides it is possible to get. Size is not of much consideration, but plumpness is more than important, it is absolutely necessary to achieve results that will be satisfactory.

After trimming place hides in clean soak for twenty-four hours, take out and mill in running water for fifteen minutes. Now flesh them clean as possible without losing any of the fiber, as every bit of fiber is precious, and put them back in clean soak for another twenty-four hours. Take out and split into sides.

LIMING.

They are now ready to lime, which should be done as follows: For each 100 pounds hides slack and put into lime vat 1 per cent of lime, and enough water to cover hides. Now put hides into the vat and allow to remain one day. Second day: Haul out the sides and add another 1 per cent of lime and replace the sides in the vat. Third day: Haul out sides, add 1 per cent of lime and one-half per cent of sulphide of sodium that has been dissolved. Fourth day: Haul and add 1 per cent of lime and one-half per cent of sulphide. Fifth day: Haul and add another 1 per cent of lime.

You will notice I have used a total of 5 per cent of lime and 1 per cent of sulphide of sodium. There is being sold at the present time a concentrated double strength sulphide, and if you use it, half the amount named above will be sufficient.

The sixth day they should be hauled out of the lime, and thrown in a vat of clean water at a temperature of about 75 degrees Fahrenheit. Allow them to remain in this warm water for about four or five

hours. Then unhair them. You will find the hair will slip quite readily. After unhairing, wash for twenty minutes in a wheel or drum, with running water, at a temperature of about 70. Do not wash in hot or very warm water, as hides will lose substance if you do. The sides are now ready for bating, which, I think, can be best accomplished with lactic acid. (Remember you are striving to make sole leather.)

BATING.

Do not bate stock in anything but a paddle wheel, cold water and about 3 per cent lactic acid. Be very sure you remove all the lime in the bate. This is of much importance to the after-treatment, and any tanner can tell when the lime is all removed by using a small quantity of phenolphthalein paper or litmus paper.

PICKLING.

After they are taken from the bate paddle, they should be weighed, then pickled, as follows: Throw the sides into a tight drum or mill, then dissolve in a clean barrel 8 per cent of sulphate of alumina and 20 per cent of ordinary salt in about twelve gallons of water. Do not lose sight of the fact we are taking 100 pounds of hides weighed from the bate as our basis for the above weights. Now start mill going and run your solution through the gudgeon into the mill. Run until pickled through. As I do not know what weight hides you will use, of course, I cannot tell you exactly how long it will take to pickle them. Assuming, for an example, that you have a 60 to 80-pound hide, it will take from eight to ten hours' running in the mill to pickle them through.

After pickling, either horse them up or pile them down in a clean place for at least twenty-four hours. You will note I said clean place, because if the sides touch any vegetable tannage, you will have a stain that will not look pretty. After the sides are horsed up twenty-four hours, they are ready to be tanned, which can be done with a one-bath chrome liquor in either a drum or paddle wheel.

USE ONE-BATH LIQUOR.

I strongly advise using a one-bath liquor. I would give directions for making a chrome liquor were it not for the fact that you can buy, already made, a better, more uniform tan liquor, as cheap or a little cheaper, than you could make it were I to give you directions. And by buying it, you save yourself the trouble of making and take no chances on not getting it correct.

If you tan in a drum, place your sides in a drum and add a solution of about 5 per cent salt and 10 gallons water, run five minutes, and then add your tan liquor in three or four parts, in about half-hour intervals. Run until the leather is thoroughly tanned. One good way to know when the leather is thoroughly tanned is to cut off two or three small pieces of the heaviest part of the sides and boil them. Boil them hard, say, about three to five minutes. When you take the pieces from the boiling water, if they shrink or are curled up, they are not fully tanned and must be replaced in the mill and run again until they will stand the above test. If you prefer to tan in a paddle wheel instead of a drum, prepare the paddle by making the water in it salty. That is, for a paddle holding 1,000 gallons of water, dissolve in it about 450 pounds of salt. For the first pack you will put in the pickled sides and run about fifteen minutes. Be sure they are swimming. Now add the first portion of the tan liquor and run one hour. Add second portion of tan liquor and run for at least two hours. Add balance of tan liquor and run until the stock will stand the boiling test.

TANNING.

You should not add your last portion of tan liquor unless you can run at least two hours before shutting paddle down for the night. It will take from two to four days to "full" tan them. At night, when you stop the paddle, allow them to lie in the liquor. I could tell you how to preserve and use the liquor in the paddle over and over again for a number of times, but this is unnecessary, as the people you buy your tan from will furnish all the directions you will require.

After the stock is tanned, horse up for at least twenty-four hours; two days is better. Now put stock in a clean drum with about ten gallons of water to each 100 pounds of sides. Dissolve and add two pounds of borax. Run mill one hour. Then place stock in a wash wheel, turn on the water and wash them two hours, using litmus paper as a test, and cutting into the thickest part of the hides. You will find the stock to be neutral, that is, there is neither alkali nor acid in the leather.

Set out the grain side by hand, oil off very lightly with a good light oil, and hang over sticks until they are in a sammied condition. Then tack smoothly on boards, but do not stretch. When leather is dry, strip from boards, and you have the best kind of chrome sole for all kinds of sporting and hospital and that class of shoes.

If you wish to make a sole for everyday shoes that will channel, burnish, and not slip on wet pavements, the treatment is just the same up to this point. The treatment that follows is being done differently in various shops.

The best method I know of is to build a large box that will take in a side at a time, and stuff or "fill" them that way, using a combination of waxes for the filler or stuffing. You can buy this stuffing or filler from several supply houses in this country cheaper and better than you can make them yourself.

In one tannery they use nothing but rosin and paraffin wax, but will admit that they are not trying to make the high-grade sole leather that the better class of shoe manufacturers are demanding.

If you can make a sample lot that is good, certainly you can make more that is equally as good or better.

SINGLE BATH CHROME TANNING PROCESS.

Dissolve 50 pounds chrome alum, crystallized, in 10 gallons of water. Heat by steam. In separate barrel dissolve 25 pounds carbonate of soda crystallized in ten gallons of water. In separate barrel mix 12 pounds chrome acid in six gallons of chlorhydric acid. When all is dissolved mix in a 50-gallon barrel, first the chrome alum, then the carbonate of soda and lastly the chrome acid. Stir well and fill the barrel with water to make 48 gallons. This will tan 800 pounds of stock from the pickle.

Dissolve in separate barrel six pounds of sulphate of alumina in 15 gallons of water. Heat with steam. In separate barrel dissolve six pounds salsoda in 15 gallons of water. Then mix alumina liquor in soda. Pour in very slowly and keep well stirred. When mixed, let stand over night. When using, heat to 80 degrees.

HOW TO USE THE LIQUORS.

Weigh the pickled stock and put it in the drum. For every 100 pounds of stock dissolve 10 pounds of salt in five gallons of water. Let it run for 15 or 20 minutes, then add the alumina, three gallons to each 100 pounds of pickled stock. Let run for half hour and then add the chrome tan liquor. Heat to 80 degrees one gallon each. One gallon each half hour to each 100 pounds of stock until the six gallons for each 100 pounds is added. Let run for eight hours in all. Stock that must be shaved and split after tanning should be retanned after shaving. In that case, give the stock four gallons of tan and tan for five hours. Before shaving mill the stock in warm salt water after shaving for 15 minutes, then add the remaining three gallons of tan slowly and let run for three hours, when it is ready to wash.

The first direction is for stock that has been split from the lime or pickle. Let the stock lie in the wheel over night, with liquor; run for 20 minutes in the morning. Then run off the liquor and prepare to wash by adding one pound of borax dissolved in three gallons of hot

water to each 100 pounds of stock. Let run one-half hour, then wash with clear cold water for two hours, or until the stock is thoroughly clean, when it is ready to be colored.

CHROME SOLE.

The immense amount of interest displayed by shoe manufacturers of this country in the comparatively new product, chrome sole leather, is attracting much thought from tanners, coupled with anxiety, writes an expert chrome tanner. The tanner of chrome leather is just beginning to realize what a stupendous task confronts him. The shoe manufacturer, knowing the desire of a great majority of the public for heavy, or perhaps it would be better to say thick, soles on his shoes—before chrome sole was introduced they had to have them—calmly requests of the tanner a sample roll of chrome sole leather sides "ten iron or over." Such orders cause tanners to lie awake nights, and wonder if there is any way to grow a new breed of cattle that will produce hides of sufficient thickness to warrant them accepting such orders.

For, let it be plainly understood, that it is very, very difficult to produce chrome sole leather of 10 iron and over. Oh, yes, it is very easy to get 10, 12 and as high as 15 iron leather, in spots; but to have it run a uniform 10 iron all over the side is indeed quite difficult, if not utterly impossible. I am referring to leather made from any hide up to 80 pounds, green salt weight. And certainly there are not enough plump hides over 80 pounds in weight to ever revolutionize the sole leather industry from vegetable tanned to chrome, and a 100-pound spready hide is not as good as an 80-pound plump hide.

CHROME WATERPROOFED SOLE.

To me it looks as though there are two very much different ways out of this trouble, and either one or the other will have to be worked out. I say *have* to be worked out, because the really wonderful wearing qualities of chrome waterproofed sole, its ability to resist water, and its many other splendid features assure it a permanent place in the manufacture of boots and shoes. The first way, and what seems to be the most difficult, is for the tanner to endeavor, by some means as yet undiscovered, to plump the hides, either before or after tanning. And right here I wish to say that there have been hundreds, nay, thousands, of attempts by various tanners, and tanners' supply men, to do so; but so far with little or no success. And that causes the following question to arise: Would plumped chrome leather be as good a wearing piece of leather as the article now produced? The writer, who has had considerable experience, thinks not; believing

that anything forced into the leather to plump it will have a detrimental effect on its wearing qualities; of that, however, there is a great difference of opinion.

BETTER PLUMPING METHODS NEEDED.

There are known today several methods of plumping chrome tanned leather, but each and every one is ruinous to the leather, and, therefore, it is impossible to use them. For any lucky individual who will discover something that will plump and not injure chrome leather—something practical—there is a good-sized fortune awaiting. The second, and what seems to be the most practical way out of the trouble, is for the shoe manufacturer, through his salesmen and customers, the retailers, to educate the public to what is now known to be a fact—that a thick, heavy, cumbersome sole is not only an extra burden for mankind to carry around, but is wholly unnecessary. Certainly that is a big job to undertake, and will entail an immense amount of work of a certain kind; but the great point I make is, it is being done now in this country by several manufacturers of shoes, and the shoe is so good that other manufacturers are being forced into line. Ask almost any tanner of shoe leather how many inquiries he has had for chrome waterproofed sole leather in the last eighteen months, and you will be greatly surprised at the large number of such inquiries.

CHROME SOLE GOOD WEARING.

It is claimed by many of those who have thoroughly tested the wearing qualities of leather that an 8 iron chrome sole will wear as long as the upper of a very great majority of shoes manufactured in this country today. Heavy vegetable tanned sole leather will not do that, as a rule, unless you are fortunate enough to get an exceptionally good sole. And the chrome sole will keep your feet dry, will never squeak, and is easy to walk on. Vegetable tanned, to the contrary, will dampen through quite readily and very often makes that unpleasant squeaking noise. There are so many desirable qualities in chrome waterproofed sole leather that it is quite impossible for me to enumerate them all in this short article.

Shoe manufacturers who have not, to date, had any experience in chrome sole leather, do not want to confound the athletic, or hospital, or sporting shoe chrome sole—commonly known by the trade as "Pearl," "Elk" or "Mercury" chrome sole—with the waterproof. There is as much difference between these as between night and day.

The above named leathers are for shoes designed and built for wearing in hospitals, or any indoor occupation, also for athletic purposes, such as bicycle riding, running, etc., etc. One of the many

reasons that has made this leather so justly popular is because while it is soft and comfortable, yet it is ample protection to the feet. It is essentially a dry weather sole, because it readily absorbs water, will not burnish on the edges, nor channel, and for the above-named reasons could not be used at all for the ordinary street shoes.

CHROME SOLE OUTWEARS ALL OTHER SOLE LEATHER.

But take that same piece of sole leather stuffed, or as some call it, "filled," properly, and you will have a piece of sole leather that will outwear, iron for iron, the best sole leather ever produced heretofore, in this or any other country. It will channel very nicely, burnish on the edges, resist water; in fact, is as its name signifies—waterproof. Also—and this is absolute—such chrome sole will not slip on wet pavements.

It is well for the shoe manufacturer to know that this leather will work on any of the machines in his factory that oak or other vegetable-tanned sole leathers will work on. And the shoe manufacturer in this country is leading the world with this new leather. What are the vast opportunities to build up an export business!

I think the shoe manufacturers who have the necessary amount of courage to attempt this will be rewarded with far greater success than they have any hopes of when they begin.

In conclusion I would like to say the above is only a faint conception of the possibilities of this truly wonderful new sole leather. It marks the greatest advance of the tanning and shoe leather industries in the past decade, and I wish to add only one thing more, and that is, Mr. Tanner and Mr. Manufacturer of shoes, make up your minds quick, and get in the game, for chrome sole leather is a success, and it is here to stay, because the public is beginning to demand it.

CHROME TANNED LACE LEATHER.

The chrome tanned lace leather that is being put on the market at this time is a very fine article. Considering that it is a new kind of leather, the tanners who are making it have done very well, but there is a chance for improvement. To make better leather, the start must be made in the beamhouse. First-class leather cannot be made with the same beamhouse work that is used for making shoe or belt leather, and the reason for this is that when beaming hides for shoes or belt leather you work to keep the hide full and plump so as to get a tight grain leather. Hides for lace leather should be worked through the beamhouse so they will be thin and flat, and by keeping the hides flat in the beamhouse a long, strong fiber is produced, which is very essential in making lace leather.

RAWHIDE LACE.

In making lace leather, tanned or tawed, with any other agent than chrome, the beamhouse work can be done about the same as for belt leather, for the tawing material—alum, salt, sulphuric acid and gambier combination—will make the hide flat. Many people say the old rawhide lace is all right and good enough, which is true as far as it goes. Rawhide lace was good enough until chrome lace leather came along, and has proved for the short time it is on the market that it is ahead of rawhide lace, and with a few changes in its manufacture it will be 100 per cent better.

WHY CHROME IS BETTER.

Where chrome lace is better than rawhide lace is that it is leather and not rawhide. It is not necessary to stuff it full of tallow to make it pliable. When it is laced into a belt it does not burn and break like rawhide belts, but will stand more heat and friction than the belts, unless they are chrome belts. How many of us have put a rawhide lace on a cross-tight belt, and in a very short time find it burned and broken where it came in contact with the pulley; also when we took it off to replace it, find that it did not show any wear? It was just burned. Such a thing never happens with a chrome lace. The nature of chrome leather protects it from the heat, and the manner in which the oils are embodied in the chrome lace leather helps to prevent heat from generating, because there is no surface grease on the chrome lace. We all know that leather or any other material with a semi-hard grease like tallow in it will generate heat when it is subjected to a certain amount of friction.

PROFIT IN CHROME.

To make chrome lace leather right and so it will show a profit, a 25 to 40-pound spready hide would be the best to buy. Give the hides a soaking of one day in soft, clean water. If the water is hard, use one and one-half pounds of sulphide of soda to each 100 gallons of water. When the hides have been soaked for 24 hours put them into a mill with a slat door and running water, and wash them for half an hour. Then put them back into the soak for 48 hours longer, when they will be ready to flesh. Be careful to flesh them clean, so as to give the depilatory agent a chance to do uniform work on the hide. If there are any lumps of flesh and fat remaining on the hide when it goes into the depilatory, the latter cannot do satisfactory work. After the hides are fleshed, make up the depilatory solution for the first day

as follows: For each 100 pounds of hides, weighed as they go into the soaks, slack 2 per cent of lime, and while it is slacking add 2 per cent of red arsenic. When it is thoroughly slacked put just enough water in the pit to cover the hides and add the lime and arsenic solution and plunge it up thoroughly. Put in the hides, being careful that they spread out and not go in in bunches. Allow them to stay in the pit 24 hours, then pull them out and add the same amount of lime and arsenic and plunge up the liquor, then put back the hides and allow them to stay 24 hours longer. Haul them out and add 2 per cent of lime and 1 per cent arsenic. Plunge and put back the hides. The fourth day pull out the hides and add 2 per cent of lime and 1 per cent of arsenic and put back the hides for another 24 hours. The fifth day pull out the hides and add 2 per cent of lime, 2 per cent arsenic and warm the lime liquor up to 80 degrees. The sixth day the hides will be ready to unhair. After they are unhaired they are washed for fifteen minutes in running water, when they are ready for bating.

BATING.

The bating should be done in a paddle wheel tub and a bacterial bate used, such as chicken or pigeon manure. The paddle vat should have a steampipe fitted into it so the bating liquor can be warmed when the hides are in it. Have the steampipe reach into the vat so it comes about one foot from the bottom. Have a box one foot square fastened to the corner of the vat, then run the steampipe into this box. Have a tight bottom in the box and put eight 1-inch holes in the sides of the box. The steam can then be turned on and the bating liquor warmed without any danger of the hides coming in contact with the steam. Always have the paddle running when the steam is turned on. Soak the manure for four days in warm water. Do not boil it; then take a medium-sized vat (8 by 8 and 5 feet deep) and put in two bushels of the manure. Have the water in the vat 85 degrees. Put in the hides and start the paddle. After it has run two hours try the temperature. If it is below 80 degrees, warm it up to that point, and keep the temperature as near 80 degrees as possible by running the paddle three hours and allowing it to rest one hour; then run another hour. The hides can be bated in five hours. If you prefer to bate them during the night, put in the hides and manure and warm the bate up to 80 degrees. Then run the paddle one hour and allow it to rest over night. The next day run it for half an hour, when the hides should be bated, so that every particle of lime is removed.

When they are bated they are put into a wash mill and washed with warm water for fifteen minutes. It is best to have running water, as it will keep the grain open and allow the dirt to wash out.

PICKLE.

After the hides are washed, they are ready for the pickle, which is made up as follows: For each 100 pounds of hides, weighed after they are washed from the bate, dissolve 10 pounds of salt in 10 gallons of water, then add 1½ pounds of sulphuric acid. Put the hides in a pin mill and add the pickle. Put on the door and see that it does not leak. Run the mill two hours, take out the hides and pile them on a horse smoothly to drain for 24 hours, then put them in the mill and for each 100 pounds, weighed after they have been horsed from the pickle 24 hours, dissolve 10 pounds of salt in 15 gallons of warm water, 85 degrees. Run the hides in this warm salt solution for 15 minutes, then drain off the water and put in for each 100 pounds of hide 5 pounds of salt and 10 gallons of cold water. In the meantime, dissolve 14 pounds of concentrated chrome one-bath tan liquor in 5 gallons of hot water for each 100 pounds of hide, weighed from the horse. Put one-half of this chrome solution in the mill with the salt solution, and run the mill 2 hours, then put in the other half of the chrome solution and run the mill 5 hours. Stop the mill with the door up and push all the hides under the liquor and allow them to stand until the next morning, then start the mill and run it for 1 hour, when the leather should be tanned. To be sure that it is tanned, cut a piece from the neck and the butt and put same in boiling water for 10 minutes. If they do not draw up in the boiling water they are tanned.

After they are tanned they are horsed up smoothly to press for 48 hours. They are then pressed and split. After splitting they are shaved and all particles of flesh taken off. The splits should also be shaved and the thin edges trimmed off. Now weigh the grains and splits, and for each 100 pounds, dissolve two pounds of borax in twelve gallons of warm water 100 degrees, and run the leather in this borax wash for one-half hour, then put the leather in a wash mill with running water, and wash for 45 minutes.

FAT-LIQUOR.

The leather is now ready to fat-liquor (not stuff). Make up the following fat-liquor: For each 100 pounds of leather, splitting machine weight, take five pounds of tallow, three pounds of German degras, two pounds of neatsfoot oil, twelve ounces of soda ash and five gallons of water. Boil this mixture one hour, then add cold water to make twelve gallons in all. When it is ready to use add six ounces of strong ammonia, liquid measure, and have it 175 degrees hot. The leather must be fat-liquored in a clean mill. If the same mill that was used for tanning is to be used, it must be washed well with a strong sal soda solution to neutralize the acid that was in the pickle and tan

liquor. When the mill is ready, put the washed leather into it and put in about fifteen gallons of hot water, 150 to 175 degrees, and run the mill ten minutes. This warm bath is to warm the leather and mill so the fat-liquor will go into the leather. Drain the warm water from the leather and put in the fat-liquor. Put on the door and run the mill three-quarters of an hour.

FINISHING.

Now take the leather from the mill and horse it up to drain for 24 hours, then set it out hard and give it a coat of neatsfoot oil and tack it on tacking frames to dry. When it is perfectly dry it is taken from the frames and staked to loosen up the fiber. The grains are then ready to trim and measure. The splits are taken from the staker and given a paste made up as follows: Four parts of tallow, one part neatsfoot oil and warm it up to 130 degrees; mix thoroughly. Next take two pounds of wheat flour and put it in the tallow and oil a little at a time. Keep stirring until the flour is thoroughly mixed with the tallow, then allow it to stand until it is cold. Now put the splits on a smooth setting table, and place them one at a time, flesh side down. Take a stiff brush and rub in a liberal coat of the paste. When it has been rubbed in hard take a glass slicker and give the splits a hard glossing, then lay them out smooth in a pile to sammy for ten days, when they are ready to measure.

The split lace will not look as nice as the grain lace, but it will wear just as long, if not longer. If your trade calls for a grain lace with a greasy face to it, you can take the grain from the staking machine and give it a coat of the same kind of paste as the splits call for, then gloss them and after they have sammied for ten days they are rolled.

This leather can be made any color desired by using alizarine dye before the leather is fat-liquored.

Another report on chrome-tanned lace leather by an experienced man is as follows:

SOAKING.

To soak dry hides in preparation to place them in the lime sulphide of soda should be used in the following manner: To each 100 gallons of water in the soaking pit use from four ounces to three-quarters of a pound, according to the degree of softness of the water. If the water used in the soaks is soft, four ounces to each 100 gallons is enough; if the water is very hard, use three-quarters of a pound. By using sulphide in the soaks the length of time for soaking can be cut down forty-eight hours. Take the dry hides and put into the

soaks and allow to remain forty-eight hours, then put them in a mill and run half an hour and put back into the same soak they were in before milling and allow to remain twenty-four hours. Now take one gallon of soft soap to each twenty-five sides and dissolve it in fifteen gallons of water, 78 degrees.

Make the soft soap as follows: Take twenty-five pounds of olive oil soap and dissolve by boiling in twenty-five gallons of water; when all is dissolved add enough cold water to make fifty gallons.

Put the hides and soap solution in a tight mill and run half an hour. Take them out and pile down over night. In the morning put the hides into a clean soak of fresh water and allow to lay twenty-four hours. They are then run through the fleshing machine and put into clean water over night.

LIMING.

The next day they are started in the limes made up as follows: For the first vat dissolve two pounds of lime to each 100 pounds of hide (weight of hides is estimated from green salted hides of the same size). While the lime is stocking add eight ounces of red arsenic to each 100 pounds. When the lime and arsenic are well stocked, put into the vat with just enough water to cover hides and plunge well. Allow the hides to lay in vat No. 1 twenty-four hours. Now make up a lime into vat No. 2, using the same amount of lime and arsenic as used in No. 1 vat. After the hides have been into vat No. 2 twenty-four hours make up a lime into vat No. 3, using three pounds of lime and eight ounces of arsenic to each 100 pounds of hide. Put hides into vat No. 3 and allow to remain twenty-four hours. Now make a lime into vat No. 4, using three pounds of lime to each 100 pounds of hides. Warm the lime liquor in No. 4 vat to 90 degrees and put in the hides, which will draw down the temperature to about 80 degrees. Allow the hides to remain in vat No. 4 twenty-four hours and then put them into clean, warm water three to five hours, when they are ready to unhair. After they are unhaired, put them into wash mill and wash with running water twenty minutes; they are then ready for the bate.

THE BATE.

The bate is made of hen manure, as follows: Take a barrel that is free from acid or grease and fill three-quarters full of hot water 120 degrees. Now stir into the hot water two bushels of hen manure and allow to soak three days. When the bating material has soaked the required length of time have a clean paddle wheel and fill the tub up to the first paddle with clean water and warm to 95 degrees. Now for each 100 sides put into the tub one and one-half bushels of

the soaked manure. Put in the hides and run the paddle one hour, then stop the paddle and allow the hides to rest three hours; next run the paddle one-half hour, when the hides should be bated. The hides must be bated low and the man in charge of the beamhouse must use his judgment as to when they are bated enough. After they are bated they should be put into a wash wheel and washed until they are clean.

THE PICKLE.

After they are washed they are ready for the pickle. The pickling can be done in a drum or in a paddle wheel. In a drum use two pounds of sulphuric acid, sixteen pounds of salt and fifteen gallons of water to each 100 pounds of hides, weighed after they are washed from the bate. Run the hides in the drum one hour, and then horse up to drain twenty-four to forty-eight hours. To pickle in a paddle wheel, proceed as follows: To each 100 gallons of water in the paddle tub use seventy-five pounds of salt. Now, for every 100 pounds of hides use three pounds of sulphuric acid. This amount of acid and salt is for the first pack. All packs after the first pack use ten pounds of salt and two pounds of sulphuric acid for each 100 pounds of hides. Put the hides in the pickle tub and run the paddle one hour and allow the hides to remain in the pickle liquor over night. The next day horse the hides up smoothly and allow to press forty-eight hours.

PICKLING IN A DRUM.

In pickling in a drum, make up the pickling liquor in a barrel. Put the hides in the drum. Put in the liquor and run the hides in the pickle one hour, then horse up same as if pickled in the paddle tub. Now for each 100 pounds of pickled hide, weighed after they have been horsed forty-eight hours, dissolve two pounds of glauber's salt and four pounds of common salt in ten gallons of water. Run the pickled hides in this solution half an hour, then drain the liquor from the drum and make up a salt solution, using six pounds of salt and twelve gallons of water to each 100 pounds of hides. Put this salt solution in the drum with the hides and run the drum ten minutes. Now take twelve to fourteen pounds of concentrated chrome liquor to each 100 pounds of pickled hides and dissolve it in three gallons of hot water, 150 degrees. When dissolved, add enough cold water to make ten gallons in all. Now take two gallons of the tanning solution and put in the mill with the salt solution and hides, and run the mill forty-five minutes. Then add three gallons of the liquor and run thirty minutes, add another two gallons of the liquor and run mill one hour. Add the remaining three gallons of the liquor and run the mill four hours and allow the hides to remain in

the liquor in the mill over night. (Be sure and see that all the hides are under the liquor when the mill stops for the night.) In the morning run the mill three hours, when the hides should be tanned. Be sure the hides are full tanned. If they are not tanned when run the full length of time described, run the mill until they are tanned. They should stand boiling water without curling before taking from the mill. After they are full tanned they must be horsed up for at least twenty-four hours. After being horsed the required length of time, the leather is put into a mill with ten gallons of water and one pound of borax to each 100 pounds of leather and run half an hour; then drain the mill and wash the leather one hour in running water. When the leather is washed clean, it is pressed and split. The splits can be trimmed and the heavy parts put into cheap lace leather. The light parts can be sold for cheap mitten leather. After the leather is split, it is ready to fat-liquor.

FAT-LIQUOR.

The fat-liquor is made up as follows: To each 100 pounds of the leather, weighed after splitting, dissolve one pound of chip soap and add three pounds of cheap neatsfoot oil and three pounds of tallow, four ounces of carbonate of potash and boil hard thirty minutes; then add enough cold water to make twelve gallons. Have the fat-liquor solution 185 degrees. Put the leather in the mill and just before putting in the fat-liquor add one-half pint of strong ammonia. Put in the fat-liquor and run the mill thirty-five to forty minutes. Take out the leather and horse up to drain over night. The next day set out and oil off with a liberal coat of oil. The leather is then ready to tack out on frames to dry. Care should be taken to stretch the leather the lengthway of the side, as that is the way laces are cut. After the leather is perfectly dry, it is taken from the frames and staked light, when it is ready to cut into laces. This leather can be colored any shade desired by giving it the coloring matter before fat-liquoring.

CHROME TANNAGE OF CALCUTTA DRY HIDES AND KIPS.

As there are a lot of Calcutta dry hides being worked into chrome leather in this country, this method will be of considerable assistance to tanners who are not familiar with the working of this class of hides.

SOAKING.

First, soak the hides for 24 hours in water into which 8 ounces of sulphide of sodium for every 100 gallons of water has been dis-

solved and mill the hides in a dry mill for one-half hour. Place back into the same water they were taken from and allow to soak 24 hours longer, then take out and mill for one-half hour in the following soap solution:

For 50 sides dissolve 3 pounds of olive oil soap by boiling in 10 gallons of water. When thoroughly dissolved add enough water to make 50 gallons, and use at 70 degrees Fahrenheit. After milling one-half hour in this solution place back in the old soaking water for 24 hours. The next day flesh clean and they are then ready for the liming, which is as follows:

One hundred pounds of hides. (It is not necessary to weigh the whole pack; weigh 50 or 100 sides so as to get an average.) Slack 1 per cent of lime and while the lime is slacking add 1 per cent of red sulphate of arsenic and stir well. This for the first day.

The second day slack 2 per cent of lime and 1 per cent of the arsenic. Put this into the second pit and reel from first pit into it.

The third day slack 2 per cent of lime and 2 per cent of arsenic and put into third pit.

The fourth day slack 1 per cent of lime and put into the fourth pit and warm to 70-75 degrees Fahrenheit and reel from third pit into fourth pit.

The fifth day slack 1 per cent of lime and put into fifth pit and warm to 85-90 degrees Fahrenheit. Reel from the fourth pit into the fifth pit. Unhair on the sixth day and put into warm water 90 degrees Fahrenheit, from which work over the beam. Then wash for five minutes in a wash mill.

If hides are to be split while raw place in cold water over night and split the next morning. If they are to be tanned whole they are to be taken from the wash mill and put into the bate or puer. A bacterial bate or puer is preferred. Acid or chemical bates will not give satisfaction. The bating reel should be covered so as to keep the temperature of the bating liquor as nearly uniform as possible. Satisfactory results cannot be obtained with the bating liquor changing in temperature from 90 degrees down to 60 degrees, as is the case when an uncovered bate reel is used.

After the hides are split in the raw state they should be washed for five minutes in the wash mill before being placed in the bate reel. When the hides are bated wash in warm water, 75 degrees, for five minutes. They are then ready for the pickle.

PICKLING.

If the hides are for patent leather, pickle as follows: For each 100 pounds of hide use 1½ pounds sulphuric acid, 12 pounds of salt and 12 gallons of water. Run the hides in this pickle for one hour in a pin mill and horse up to drain 24 hours.

If the hides are for box, velour or mat finish, pickle as follows: Four pounds of German sulphate of aluminum, 8 pounds of salt and 12 gallons of water. Run in pickle three-quarters of an hour and horse up 24 hours.

The hides are then ready to be tanned, with either the single or double bath method. Single bath is the best for patent leather. I will not attempt to describe the single bath method, as there are so many different formulæ for this class of leather, but will leave it to the judgment of the tanner.

DOUBLE BATH METHOD.

A very good double bath method is this: Five and one-half per cent of bichromate of potash is dissolved in 15 gallons of water and 1 per cent of sulphuric acid is added for each 100 pounds of hides, pickled weight. Run the hides in this chrome bath for 3 hours, then horse up for 48 hours. Now dissolve 18 per cent of hyposulphite of soda in 20 gallons of water. Put the hides in the mill with the hypo solution and start the mill. Then take 3½ per cent of muriatic acid and dilute with 2 gallons of water. Feed this to the hides in the hypo solution through the gudgeon of the mill while the mill is running and run the mill until the hides are blue clear through. Then remake the hides and wash two hours in a wash mill with running water.

After washing, press and shave, when the leather is ready for fat-liquoring.

FAT-LIQUORING.

A good fat-liquor for patent leather is made as follows: Dissolve one-half pound of good soft soap in warm water and add 2 pounds of neatsfoot or cod oil and 3 pounds of cottonseed oil. Boil for half-hour and cool down to 160 degrees Fahrenheit, and stir in 1 pint of moellen degras and 3 ounces of powdered borax. Stir well and it is ready for use. Use at a temperature of 130 degrees Fahrenheit. Add enough water to make 12 gallons when done. This amount is for 100 pounds of leather, shaved weight. Run the leather in the fat liquor 30 minutes and drain the mill. In the meantime dissolve 1 pound of logwood crystals and 4 ounces of permanganate of potash in 10 gallons of water. Add this to the hides in the mill and run 30 minutes. Now add 3 ounces of copperas dissolved in 3 gallons of water and run 10 minutes. Take hides from mill and horse up to press and drain 24 hours. They are then set out and oiled off with 3 parts paraffine oil and 1 part olive oil. Hang up and dry. When dry dip in warm water, about 120 degrees Fahrenheit, and pile down and cover well while the leather is warm and allow it to lay 24 hours. It is then ready to stake and tack on the stretching frames to dry. When dry the leather is ready to napthaerize and japan.

GLAZED OR MAT LEATHER.

If the leather is to be finished into glazed or mat leather, it is to be treated as follows: For each 100 pounds of leather, shaved weight, dissolve 1½ pounds of logwood crystals in 15 gallons of water. When dissolved add 3 ounces of powdered alum and 1 ounce of powdered borax. Dissolve the alum in a gallon of water and stir in slowly after the borax has been added. Run the leather in this coloring liquor for 25 minutes, then dissolve 1½ ounces of copperas and 1 ounce of bichromate of potash in 3 gallons of water and add to the leather and run 10 minutes. Drain the mill and wash for 15 minutes with at least three changes of water, using warm water for the last change. The leather is then ready for the fat-liquor, which is made as follows: For 100 pounds of leather, shaved weight, dissolve one-half pound of good soft soap in two gallons of water by boiling, then add 2 pounds of good olive oil, 1 pound of cottonseed oil and boil 30 minutes. Cool down to 160 degrees Fahrenheit and stir in 1 pound of moellon degras and 3 ounces of powdered borax. Add water to make 10 gallons and use at a temperature of 130 to 145 degrees Fahrenheit. Run the leather in the fat-liquor one half-hour and horse up over night. Set out and oil off with a light coat of good olive oil and paraffine oil of equal parts. Hang up to dry. When dry, damp, stake and tack same as for patent leather.

A GOOD ENGLISH GRAIN CHROME LEATHER

can be made by the following method: Pickle and tan the same as for glazed side leather. Black same as for box sides and fat-liquor as follows: One and one-half pounds soap, 4 pounds good, hard tallow, 4 pounds German degras, 4 pounds No. 2 sole oil. Boil one-half hour and add enough water to make 12 gallons. Use at a temperature of 165 degrees and horse up for 24 hours. Set out and oil off with neatsfoot oil, giving a generous coat and hang up and dry. Then dampen, stake and tack. When dry, trim and finish with a seasoning made as follows: One-half pound olive green soap, 1 quart moellon degras, 4 ounces Irish moss, 2 ounces logwood crystals, 2 ounces nigrosine. Boil 20 minutes, cool and strain and water to 2 gallons. Give the leather a good coat of this seasoning and when dry roll on a heavy jack, using a heavy pressure, then grain and oil off with a heavy coat of equal parts of neatsfoot and paraffine oil.

CHROME TANNED VEALS.

A large amount of business is done in chrome tanned colored veals. This leather is made and sold under such names as "stormproof veals," "winter calf," "waterproof calf" and "sporting boot kip." No

matter what name it is called, it is one of the first-class leathers for a winter shoe, and it is the opinion of a large number of shoe manufacturers that it is a leather of merit and one that will stay at the top for a long time.

To make this class of leather it is necessary to buy good, plump veal skins, or a small run of kip skins. A spready veal will not work to advantage, for this class of leather is bought in H. M., H. and H. H. weights only. The spready skins the tanner is bound to get when buying veals can be worked into velour, gun-metal or box calf finishes, as those kinds of leather are all worked through the tannery as far as the color room by the same process. When they get to the coloring and fat-liquoring stage they are sorted and the light, spready skins are blacked and fat-liquored so as to finish up in the above-named leathers.

IN THE HIDE HOUSE.

To start working this class of skins through the tannery, the beginning must be made in the hide house, where the skins are to be trimmed before going into the beamhouse. The trimming should be done by a careful man, one who can be depended upon, for one who does not understand this business can cause considerable loss by cutting away too much of the skins, or by leaving on too much, as the long shanks and heads are worth more if sold for glue stock in the hair than if left on and sold for scrap leather after being trimmed off at the sorting table.

When the skins are trimmed they are put into a soak of clean, cold water for 24 hours. If the water is very hard, soften it by adding one pound of sulphide of sodium, which has been dissolved, to each 100 gallons of water. This sodium will not cause any trouble, in fact, it will be of benefit to the skins. After they have been in the soak twenty-four hours, put them into a wash wheel and wash with running water for fifteen minutes. This washing removes the dirt and helps to open up the skin. From the wash wheel they go to the fleshing machine and are fleshed, or as some tanners say, broken. They are then put into a clean soak for another twenty-four hours, when they are ready for the limes.

LIMING.

The old way to lime skins was to do it in a pit or vat. The up-to-date tanner does it in a paddle wheel. The lime is started by using 2 per cent of lime to the weight of the skins in the hair (weigh the lime, do not guess at it, for the day of the "guesser" in the tanning business is past). Put the skins in the paddle of lime and run the paddle ten minutes and allow it to lay until 5 p. m., then run it five

minutes again. The next morning slack 2 per cent more of the lime and add to the paddle wheel while it is running. Allow it to run five minutes, then lay still till evening, when it is run another five minutes. The third day give them 2 per cent more of lime and 1 per cent of red arsenic to the weight of lime used for the entire liming system. The fourth day give the same material, and same amount, given on third day. The fifth day give 2 per cent of lime and warm the lime liquor to 70 degrees in warm weather and 80 degrees in cold weather. Run the paddle for five minutes, morning and night, each day. On the sixth day give them 2 per cent more lime, and on the seventh day they are ready to unhair.

UNHAIRING.

The skins can be unhaired on a machine or by hand. If they are unhaired on a machine they must be worked for fine hair by hand. Put the skins in warm water after they have been through the machine and work them on the beam from the warm water, and under no consideration allow the working for fine hair to go until after they are bated. The proper time to fine-hair is right after the machine, while the skins are full of lime and they are in a swollen condition. The hair cells are then distended and the fine hair and gurry will come out easily. Just as soon as the skins are washed and the lime removed, abatement takes place and it is a very difficult operation to remove the fine hair and dirt. After the skins have been fine-haired they should be washed for fifteen minutes with running water to remove part of the lime. After washing the skins are cheeked; that is, the heads split down to the thickness of the shoulder. This operation is performed on a cheeking machine, and not by hand or on a splitting machine. When the skins are cheeked they are ready for the bate.

BATING.

The bating is done in a covered paddle wheel in which there is a steampipe carefully boxed in so as to warm up the bate when the skins are running. (The lime paddles should be fitted with a steampipe the same way.) Some tanners will hold up their hands in horror when you mention warming up a liquor while the skins are in it. There is absolutely no danger when the pipe is properly boxed in. The way to do it is to have a false end to the paddle tub about two inches through—that is, two inches of space between the false end and the true end, and have twelve or fifteen one-inch holes in the false end about eighteen inches from the bottom. Have the steampipe made with a bend in it so it will correspond with the curve of the round bottom of the paddle tub. If the paddle tub is fitted up this way it is

impossible to burn the skins if the latter are turning when the steam is on. It is the only way of getting uniform bating done, for the skins can all be put in while the bate is cold, the paddle can be started and the steam turned on, and when the bating liquor is up to the proper temperature the skins are all of the same temperature and will get uniform action in the warm bate.

PICKLING.

The pickling is done in a paddle wheel, with salt and oil vitriol of 66 degrees strength. To start a pickle it is necessary to know just how many hundred gallons of water the paddle wheel will hold when it is filled so the water just touches the paddle. Then dissolve in the paddle tub 80 pounds of salt for each 100 gallons of water in the paddle tub and put in three to four pounds of sulphuric acid for each 100 pounds of skins weighed after they are washed from the bate. Put in the skins and run the paddle wheel two hours and allow the skins to stand in the pickle liquor until the next day, when the reel is run for one-half hour. The skins are then taken out and spread out smooth in a pile to drain for at least 24 hours, when they are ready to tan. The pickle liquor does not have to be made fresh for every pack. It can be used for ten to fifteen packs, when it should be cleaned out and a fresh one made. For successive packs 3 pounds of acid and 24 pounds of salt should be used for every 100 pounds of skins.

TANNING.

The tanning is usually done in a pin mill drum. The drum should be 8 feet in diameter by 5 feet wide on the inside and have round pins 10 inches long. It should be fitted with hollow gudgeons and a feed tub with a brass leader running through the gudgeon so as to feed the liquor to the skins while they are in motion. Care must be taken to have a light door in order not to lose any liquor. The skins can be tanned in either the single bath or the double bath. The single bath is considered better, as there is no sulphur in a good single bath liquor, and a uniform color, one that will not fade, will be obtained. There are numerous formulas for making single bath tan liquors, to be had cheap, but the best way to get started right in making any kind of chrome leather is to buy the chrome liquor all ready to use from a good reliable firm having a reputation back of it for making and selling goods that are uniform. This kind of a firm will furnish the latest directions as to how to make crome leather and will send out demonstrators with their goods to any reliable tanner, whether large or small.

TWO-BATH PROCESS.

To tan skins by the double bath system, the skins are weighted after they have lain in the pickle 24 hours, and for each 100 pounds, dissolve 6 pounds of bichromate of potash by boiling it in 4 gallons of water. A wooden receptacle must be used to dissolve all chemicals.) After it is dissolved add enough cold water to make 15 gallons. Place the pickled skins in the mill, put on the door and feed the bichromate of potash liquor through the feed tub. The mill must be running before starting to put in the liquor. After the last of the liquor is in the mill, run it for five hours, then take the skins from the mill and place them in a pile without any wrinkles in them to drain twenty-four hours. Rubber gloves must be worn by the men handling skins in the yellow chrome, as it is very poisonous and will cause sore hands. After the skins have lain in a pile for twenty-four hours they are run through a putting-out machine, or are struck out by hand to remove all wrinkles and to insure a smooth grain. After they are struck out they are ready for the second bath, which consists of hyposulphite of soda and muriatic acid. Dissolve twenty-two pounds of hyposulphite for each 100 pounds of skins, pickled weight, in eight gallons of water by boiling them. Cool it down by adding enough cold water to make fifteen gallons in all. Put this hypo liquor in the drum, put in the skins and close the door, then start the mill. In the meantime take five pounds of muriatic acid to each 100 pounds of skins and dilute it with three gallons of water. After the mill with the skins in has been running ten minutes, add the acid liquor through the feed tub and run the mill five to six hours. Under no circumstances must the mill be stopped until it has run three hours after putting in the acid. When the skins have been running in the hypo five hours, cut into the thickest part of the skin. If it is blue all through it is tanned, and they are taken out and placed in a smooth pile for twenty-four hours. If there is a streak of yellow in the center of the skins they should be kept in the mill and run until it is gone. After they have lain in the pile twenty-four hours they are ready to wash.

The single bath and double bath leathers are handled identically the same after they are tanned.

WASHING.

To wash chrome tanned leather there should be a wash drum made just the same as a tanning drum, except that it should have running water connected with the mill, with a one and one-quarter-inch pipe going through the gudgeon on one side of the mill and a feed tub on the other. It should also have eight one and one-half inch plugs in the circumference of the drum. Put the skins in the wash drum and run in enough water so the skins can flush easily, put on the door

and start the mill. Now dissolve two pounds of borax for each 100 pounds of skins and add it to the skins through the feed tub and run the mill for a half hour. Now take out the plugs and turn on the water and wash the skins for an hour. They are then ready to press for shaving.

Do not split the skins, expecting to make money out of the split. It is better to put the skins on the market as heavy as they can be made, for this class of leather is made into heavy shoes and the heavy skins bring enough money to offset what the split would bring twice over. When the skins are shaved they are sorted. The nice clean heavy skins are put into colors and the heavy skins with salt stains or other defects in the grain are put into black storm grain. The light weight skins are put into box, velours or gun metal finish.

COLORING.

After they are sorted the skins for storm grain colors are put into the mill for coloring and slushed up with plenty of warm water, when they are ready for the color. The prevailing color this season is made as follows: For each 100 pounds of skins weighed after shaving dissolve three-quarters of a pound of alizarine leather brown, B, No. 9052, by heating six gallons of water up to 190 degrees and stirring in the dye. When it is all dissolved cool it down to 165 by adding cold water to make ten gallons. Start the drum and add the dye through the feed tub and run for half an hour. In the meantime dissolve one quart of extract of yellow fustic in one gallon of warm water and add to the drum and run it fifteen minutes. Then drain off the spent dye bath and give this fat-liquor, which has been previously made up. Three pounds of good hard tallow boiled for three-quarters of an hour with one pound of good soft soap and three ounces of soda ash. After it has been boiled the required length of time turn off the steam and add to the fat-liquor three pounds of moellon degras and stir well for five minutes, then add water to make twelve gallons, and just before putting it in the mill add two ounces of strong ammonia. Run the skins one-half hour and place on a buck to drain over night. Use the fat-liquor at a temperature of 150 degrees. This fat-liquor is used on the black storm grain also.

Color the black skins by using one and one-half pounds of logwood crystals and two ounces of black nigrosine to each 100 pounds of skins. To set the black use one-half ounce of bichromate of soda dissolved in three gallons of water.

FAT-LIQUOR.

To fat-liquor the black skins for glaze finish use one pound of soap, two pounds of 30 cold test neatsfoot oil and two pounds of olive

oil for each 100 pounds of skins. After the skins are bucked over night they are set out hard and the colored skins are oiled off with a coat of neatsfoot oil. The skins for glaze are oiled off with No. 3 finishing oil. They are then hung up to dry and when perfectly dry they are all handled alike, dipped into hot water for about three minutes and then packed in boxes and covered up so as to keep them warm and allowed to stay for forty-eight hours, when they should be staked and tacked out tight on boards or tacking frames and kept on the frames until they are perfectly dry. They are then taken from the frames and trimmed and finished.

FINISHING.

The skins for glaze are given a coat of finish, and, when dry, glazed and given a second coat of finish and glazed the second time. The smooth ones are ironed with a hot iron and the rough-grained ones are grained into a box grain. The storm-grained skins are given a coat of dull colorless finish and when the finish is dry they are rolled or grained. The black storm grain skins are given the same finish as the colored ones, except that the finish is colored with black nigrosine. After they have been grained they are oiled off with a mixture of half No. 3 finishing oil and half neatsfoot oil.

CHROME SOLE LEATHER—GERMAN PROCESS.

As chrome sole leather is the latest thing in the market that has created a large amount of interest, writes a practical tanner, there will be many tanners who will want to make it (I have in mind the waterproof sole leather tanned with chrome), especially since the chrome sole leather does not require a large amount of room to make it, or a long time to get it out. A tanner can buy his hides and in thirty days have his leather ready for the market. It goes without saying that there will be plenty of it made, which will be sold for job lots, as it will be almost worthless. It looks easy to make, but it will require some time and experience to get it out right so it will be waterproof and the shoemaker can work it through his factory without much trouble. It will be unfortunate for the tanner who makes it all right to have a lot of mongrel leather put out, for it will cause him plenty of trouble to sell his stock to the shoemaker who has been stuck.

FRAUDS IN THE TRADE.

Then, again, there will be the consumer who will get bit, and who will have a hard word for anyone who talks chrome sole for his shoes. There are some shoemakers who at this early day are staining the

bottoms of their shoes so they look like chrome. When the stain wears off all there is left is a cheap piece of leather that is worse than a sponge to soak water and wears like leather board. The tanners who make a chrome sole and the shoemakers who use them will be compelled to contrive some way to show up the frauds. The tanner who contemplates the making of chrome sole leather should be in a position where he can place the hides that he gets that are not suitable for sole leather. He should buy as nearly as possible a plump 40 to 60-pound hide. Spready hides will not do. It requires a plump hide, so the belly can be worked up. Another thing, he must not lose sight of the fact that it is impossible to plump chrome leather and have chrome leather when he gets through plumping same. Chrome tanned leather can be taken and put into extract or bark liquors and plumped up fine, but as soon as it is filled up with the vegetable liquor it loses all the character of chrome. It is not chrome and it is not as good as straight vegetable tanned leather.

STARTING RIGHT.

To start right to make chrome waterproof sole leather a tanner must have paddle wheels, mills or drums and tacking frames. He should soak his hides in clean, cold water for three days. If the water is hard, borax should be used to soften it. When the hides have been soaked forty-eight hours they should be put into a paddle wheel with running cold water and washed for one hour to remove the dirt and open up the hide. They are then put back into a clean soak of cold water for twenty-four hours more, when they are ready to flesh. Care must be taken to flesh the hides clean so they will take the lime uniformly. It will require six days' liming to remove the hair and open up the hide so it will take the tanning freely.

LIMING.

To start with, there should be a row of limes seven pits long in order to have a system of reeling from one pit into another every day and have pit No. 7 for the warm water.

In the first pit use 2 per cent of lime to the weight of the hides in the hair. Allow them to lay twenty-four hours, then make up a lime into pit No. 2, using 2 per cent lime. Allow hides to stay twenty-four hours. Into pit No. 3 make a lime, using 1½ per cent of lime and 1 per cent sulphide of sodium. Into pit No. 4 make up a lime. Use the same materials as in No. 3. Into pit No. 5 make up a lime, using 2 per cent of lime, and the same into pit No. 6. Clean the limes every four weeks, starting with pit No. 1, and cleaning them in rotation. After the hides have been in pit No. 6 for twenty-four hours they are

reeled over into pit No. 7, which contains warm water 80 degrees Fahrenheit, and allowed to lay three or four hours, when they are ready to unhair on a machine. After they go through the unhairing machine they are put into warm water again, and from there they are worked over the beam to remove the fine hair and gurry. They are then placed in a washmill and washed fifteen minutes in cold water. If the flesh is not off good and clean, they should be limed or refleshed, when they are ready for the bating or deliming.

BATING.

This operation should be done in a paddle vat or England wheel. The deliming agents should be either lactic acid or formic acid. If lactic acid is used, three to four pounds to each 100 pounds of stock, hair weight, are required. If formic acid is used, take one pound to each 100 pounds of stock. The lactic acid process is safer. Warm the water in the paddle tub up to 85 degrees, put in the acid and run the hides one to two hours and allow them to remain in the bate over night. The next morning run the paddle one hour and take out the hides and wash in the washmill with running water for ten minutes. There is no danger of depleting the hides in the lactic acid bate. The pack that goes in on Saturday night can be allowed to remain over Sunday with perfect safety. The bating liquor must be made up fresh for each pack. After the hides are washed from the bate they are ready for the pickle.

PICKLING.

The pickling is done in a pin mill drum that runs twelve revolutions to the minute. Have the door of the mill up from the circumference of the mill as far as it is possible to put it. Be sure that the door fits tight so there will be no waste of liquor. Weigh the hides from the bate and for each 100 pounds of hide dissolve six pounds of sulphate of alumina and eighteen pounds of salt into fifteen gallons of water. Boil the alumina in a small amount of water, and when it is all dissolved add cold water to bring the temperature down to 70 degrees, then add the salt. Put the hides in the mill and add half of the salt and alumina solution and run the mill one hour, then add the other half of the pickle and run the mill one and one-half hours. Now take out the hides and allow them to drain twelve hours, then hang them up to dry. When they are thoroughly dry put them into a tub of warm water to soften. Have the water about 90 degrees. When they are soft place them in a mill and put in enough cold water to completely saturate them, and in fifteen minutes they are ready for the tanning liquor.

TANNING.

Tanning is done in vats. To start a fresh liquor, dissolve five pounds of concentrated one-bath chrome liquor for each 100 gallons of water in the vat. Now weigh the hides as they are taken from the mill in which they were washed, and for each 100 pounds of hide dissolve twelve to fourteen pounds of the concentrated liquor in four gallons of water. Next add one-quarter of the tanning liquor to the vat, tack the hides on sticks, using brass nails. Hang the hides into the liquor and be careful to have them completely covered with the liquor and do not crowd them in the vat so they will touch. A good system to work is to have a block one inch thick tacked on the edge of the vat so there will be a block between each stick, which will prevent their touching. After they have been in the liquor for twenty-four hours take them out and allow them to drain two hours. Then add another quarter of the tanning liquor to the vat and put the hides back into the liquor. Be sure and change the positions of the sides each time they are taken out so as to avoid any possible chance of having what is called "kiss spots."

DRAINING.

To avoid wasting the liquor when the hides are draining, a tray should be made of matched lumber the length of the vat and five feet wide. Have it made so it will set at an angle of about 10 degrees. When pulling the hides from the liquor lay them on the tray and the liquor will run back into the vat and the waste of tanning liquors will be the minimum. After the hides have been in the liquors the second twenty-four hours raise them and allow to drain two hours. Now put into the vat another quarter of the liquor, plunge up the liquor and replace the hides. After they have been in the liquor the third twenty-four hours raise them and allow them to drain two hours, and put in the remainder of the liquor. Plunge up the liquor and put the hide back into the liquor again and allow them to remain two days, then take them out and drain them over night and put them back for two days more, when they should be tanned. Cut a piece from the thick part of the butt and put it into boiling water for five minutes. If it does not draw or curl up they are tanned. If they are not tanned allow them to drain over night, then put them back into the liquor until they are tanned. Examine the liquor and see if it needs more tannin. Take a glass of it and hold it up to the light. If it is a dark green color it does not need any more tannin. If it is a light green, add more of the liquor, say, two to four pounds to each 100 pounds of stock.

DIFFERENCE OF WATER.

It is impossible to give specific directions that will fit in all tanneries on account of the difference in the water. If the water used for tanning is hard, a quart of lactic acid should be put into the vat for each 100 gallons of water it contains when making up a fresh tanning liquor. After the first pack has been tanned in a fresh vat of liquor it can be followed up with successive packs by using twelve to fourteen pounds of the concentrated liquor to each 100 pounds of hide until ten packs have been tanned, then the liquor should be run off and a fresh liquor started.

MILLING.

After the leather is fully tanned allow it to lay from three to seven days, then put it in a closed mill with three pounds of borax and fifteen gallons of warm water to each 100 pounds of leather and run the mill one hour, then put the hides into washmill and wash for one hour with running water. After they are washed they are allowed to drain, or press them lightly and give them a fat-liquor, using two pounds of white chip borax soap and one pound of neatsfoot or cod oil boiled in eight gallons of water for half an hour. Now add water to make fifteen gallons. Use at a temperature of 165 degrees, run the leather in the fat-liquor forty-five minutes, and take out and set it out good and hard, then tack it out tight on the frames to dry. Be sure it is perfectly dry before taking from the tacking frames. Do not stretch too hard, for it will make the bellies too thin. When the leather is dry it is ready for the waterproof filling. The filling is a commercial article and the firms who make it furnish full directions as to how the leather is filled with it, and they guarantee it to be perfectly waterproof.

CHROME-TANNED SPLITS FOR TRIMMING CARRIAGE SEATS AND FURNITURE.

Tanners of chrome-tanned hide and side leather are often puzzled to know how to make best use of the splits, writes an expert. It is a problem which may be solved, however, and I shall attempt to show in a small way how these splits can be placed on the market and command a good price.

One of the principal reaasons why more tanners do not adopt the chrome method of tanning is lack of knowledge as to how to profitably dispose of the splits. After your hides or skins are tanned either by the one or two bath process, they should be permitted to drain thoroughly. A good plan is to horse up for twenty-four hours. Care

should be taken to lay them out smooth as possibly. The next operation is the splitting, which may be done on either the union splitting machine or on a belt knife machine. I would say that the belt knife machine would be the most desirable, although very nice work can be done on the union, if it is properly geared.

If the splits are the proper substance, the next operation is to mill them in lactic acid in a weak solution, say, one gallon of acid to forty gallons of water; run them ten minutes and draw off waste liquor. Then make a solution of five pounds of salt and five pounds of whiting to twenty gallons of water, and wash the splits in the mill; run twenty minutes; rinse until all traces of whiting are removed; run off water. Take for 100 pounds of splits ten pounds of logwood extract, or crystals, and dissolve in three gallons of water. After dissolving add cold water so as to reduce the temperature to 120 degrees Fahrenheit. Run your splits in this mordant for twenty minutes or until all the strength of the solution is taken up by the stock. Then prepare the dye bath.

PLUM COLOR FOR 100 POUNDS OF SPLITS.

Dissolve 6 ounces diamond fuchsine.
Dissolve 4 ounces Bismarck brown, R. S.
Dissolve 2 ounces new blue.
Boil in separate vessels and strain and mix together and add to the whole while in motion; add very slowly at first; run thirty minutes.

DARK NAVY BLUE FOR 100 POUNDS OF SPLITS.

Dissolve 10 ounces of new blue, and add to the wheel, same as for the plum.

FOR DARK GREEN.

Dissolve 6 ounces arumine, 11.
Dissolve 6 ounces new blue.
Add to wheel same as for plum.

FAT-LIQUOR.

Before taking the splits from the mill run off the waste liquor and make a fat-liquor for 100 pounds splits.
Two pounds fig soap.
Two pounds sperm oil.
One pound degras.
Boil the soap until dissolved, then add oil and degras. Cool to 120 degrees Fahrenheit. Run this solution twenty-five minutes, rinse and

horse up over night, ten to twelve hours. Slick on flesh and grain and hang up to dry. When dry, dampen and stake them. Buff on a buffing jack, so as to raise up a nap, and if the splits show any light streaks or threads on the surface, flame them over with some of the same color they were colored in at first, and then you have a split that is quite popular and salable for trimming carriage seats and is largely used on furniture that is upholstered in leather and is taken in place of gimp. If the directions are followed strictly, soft, pliable leather will be obtained which is necessary for the purpose mentioned.

CHROME LEATHER SUGGESTIONS.

There are many tanners starting to make chrome shoe leather from hides who will save themselves trouble by going at it in the right way. Nine tanners out of ten who are now making bark-tanned leather and starting to make chrome will use the same beamhouse system on the hides intended for chrome leather as they do for bark leather. That is wrong.

RESULTS WITH CHROME TANNAGE.

The hides must be unhaired with a minimum amount of lime or sulphide, or whatever agent is used to remove the hair. The reason for this is that there is nothing used in the manufacture of chrome leather that will fill the hide. If you lime heavy or longer than necessary to remove the hair, you not only remove hide substance but you will have to bate just so much more to remove all the lime, and the longer you bate the more hide substance you will lose, and with nothing in the chrome process to fill it up you are bound to get a loose grain and a large, thin, flaky flank.

Tanners should not get the idea that the hides should be bated just a little; they should be limed enough to remove all the hair, as chrome leather is all finished on the grain, and if there is any fine hair left it will be a detriment to the leather. They should then be bated so as to remove all trace of lime, as lime left in a hide and tanned with chrome is one of the worst things that could happen. Use a bacterial bate, as there are no acid or chemical bates that will give as good results. When you are sure the lime is all removed from the hide, it should be washed before pickling! Never take a hide from the bate and put it into the pickle without washing. Care must be exercised in washing from the bate, as the hide is in the most critical condition at that point. Overwashing will cause loose leather. Be careful to keep the hides as clean as possible. Do not allow them to come in contact with any kind of vegetable tan liquor, especially on the grain side, or it will show on the finished leather and is liable to cause a brittle grain.

SPOTS ON THE GRAIN.

After the hides are pickled do not allow any water to come in contact with them unless it be salt water, as fresh water will withdraw the salt from the hide and leave the acid, which will cause a blister or acid burn. This thing has happened in some of the very best chrome tanneries, and when the leather was finished there would be spots on the grain that would crack with the touch of the finger, and the rest of the same side or skin would be perfect.

TOO MUCH HURRY.

When tanning do not be in a hurry. Give the hides time. Because chrome is a quick tannage, do not expect it will perform a miracle. If the hides get warm, or even hot, while tanning, do not be frightened. I have seen hides taken from a mill tanned when they would be so hot it would be almost impossible to handle them and they made first-class leather. In fact, some tanners warm the water and liquor they use and claim they get better results by so doing. After the hides are tanned, either horse them up or pile on the floor or a rack for at least twenty-four hours. Be sure to have them smooth, so all parts of the hide will have equal treatment. If part of them are on the pile and the remainder hang over the edge, the part that hangs over will not have a fair shake, as the part that is in the pile gets the benefit of the liquor that is in the hides.

Some tanners wonder why the heads and shanks of their leather are so hard. If they will look at the leather as it is in the tanning pile they will see that the heads and shanks are not pressing as the bodies of the hides are. I have in mind the one-bath process, as there is very little side or colt leather made any other way now, but if you are using two-bath, you must be just as careful in horsing up out of the chrome.

CAREFUL WASHING.

When washing from the tan be very careful to remove all traces of acid before staining the leather. If you have a generous supply of water do not use any alkali; just run the leather in a washwheel with the cold water running on the leather for at least one hour. If your water supply is limited you can use some mild alkali, such as borax, bicarbonate of soda or carbonate of potash, and run the leather in a tight drum for thirty minutes in the alkali water. Then drain the water off and rinse well in three or four changes of clean cold water. When staining use a good quality of logwood crystals or paste and a little alum to get a good blue black. It is not necessary to use any aniline dye, but it is quite necessary to use a good iron striker. There are commercial strikers on the market that give good results and are

almost as cheap as you can make yourself from copperas and blue-stone, and they are clean. After using the striker always wash the leather to remove all traces of the strike. If you do not wash you will have trouble with the fat-liquor and your finished leather will be smutty and dirty. When the leather is fat-liquored, always allow it to lay on the horse over night before setting.

THE DRYING PROCESS.

After setting do not hang over sticks to dry. Use tender-hooks and hang up the side by the back until dry. The reason for this is that if you hang up over a stick the side in drying will contract except where it goes over the stick, and when it comes to tacking on the boards you will have a very large hump where the stick was used, and it is a difficult task to tack the back straight, which is very essential in making good leather. When dampening the sawdust do not get it too wet. If you do the leather will come from the frames hard. Dampen the sawdust the day before you want to use it so as to give it a chance to draw the water through and become uniform. Use frames with belly-boards and be sure and get all the stretch out of the side so as to get all your measurement and avoid having bags in the side, so when you glaze the leather it will not pinch under the gloss. Use a good clean finish for glazed stock, made of either caseine or blood, and rub the first coat in hard. Do not have the finish too heavy. The less finish used to get results you are after, the better your leather will feel when done. Always use a hot oil to oil off after the finish.

WORKING DRY FLINT HIDES FOR CHROME LEATHER.

In soaking flint dry hides for chrome leather up-to-date tanners depend on chemicals in water, well knowing that by soaking in the usual pond water, containing no chemicals of any kind, it is almost impossible to properly soften the inner structure of the hide without pricking the grain.

Some few years ago Salem and Peabody tanners soaked these flint hides on the banks of a salt water river by the use of tide water. The hides were softened quickly by the incoming warm tide water, and when the tide receded they were exposed to the sun, causing them to sweat.

THE SWEATING OF THE HIDES.

helped in a great measure to soften them and also caused the hair sheaths to start. On being milled in the hide mill the hides milled up quickly, but the hair came off the grain, leaving the grain exposed

to the air, and from being exposed to the air the grain turned a brownish color, and when worked over the beam, after the lining process, these places were rough under the unhairing knife. As these hides were tanned for wax leather, which was finished on the flesh side, this roughness did not make so much difference, but today, the finish being applied to the grain, it would be quite a drawback.

While tide water is excellent for soaking all classes of dry hides and skins, the soaking should be accomplished in pits. Tanners who are located near the salt water have a wooden shute running out into the river, some distance below high water mark, and when their pits are full of water drop the trap, and the hides are kept covered with water.

Tanners who are not located near the tide water use caustic soda, borax, sulphide of sodium, etc. Many prefer borax to any of the other alkalies, saying that, although the first cost is a little more, the fine grain that is produced and the manner in which the hide or skin works out in the tanning and finishing more than offsets the extra cost.

The hides, after being soaked, are either milled in a hide mill or in the drum. For this purpose the hide mill does the best work, breaking up the tissue in a much better manner than does the drum.

THE MILLING OF THE HIDES

should be carefully looked after, as a large amount of glutinous matter in the hide may be lost by prolonged milling. All hides do not soften alike, and after a hide has reached a certain stage any extra milling results in a loss of hide substance. Many a man when tending a hide mill has noted the stickiness of the hides after they have begun to warm up. This sticky substance is the gelatine of the hide. I once heard an old glue manufacturer say that if there was any way of saving this gelatinous matter lost in the hide mill he could in a short time make a fortune. Some tanners seem to think that if they keep the man who tends the hide mill on the jump, wheeling hides to the mill, putting them in the stocks, spreading them down to split, and, after splitting, returning them to the water pits, they are getting a big return for wages paid.

It is a fact that a man who knows how to mill hides can save many dollars to his employer not only in steam power but in hide substance. This is one of the places in a tan yard where a skilled man should be employed, but, strange to say, it is rarely the case that one is.

Hides, after milling, should be returned to the soaks, and if they have been properly milled the after-soaking is rapid, and in a day or two the hides are ready for the limes. As it has been told many times that lime attacks hide substance before it does the hair and that sulphide of sodium attacks the hair before it does the hide substance, it

would seem that by using both one must strike a happy medium. Enough sulphide should be used in connection with the lime to bring the hides into condition to unhair easily, on the machine, in four or five days. The lime liquor gets old rapidly and must be run off every two weeks in winter and once a week in summer.

AFTER THE HIDES ARE LIMED

they should be placed in water at a temperature as nearly like that of the lime liquor as possible and left until the next day before starting in to unhair on the machine. The grain of the hides on coming from the lime is rough and if left over night in the water it is softened and a smoother grain results after the leather is finished.

Many tanners split away the grain on the belt knife in the beamhouse for the chrome, and tan the split either in bark or extract. The grains are run in a paddle wheel containing lactic or boric acid, to kill the lime, and the splits are taken after washing in water and suspended in the liquors. By this method of tanning the splits tanners are getting 65 to 70 pounds of leather from 100 pounds of green splits.

CHROME-TANNED GRAINS.

In finishing grains from leather tanned by the chrome process care should be taken that the color be sufficiently deep before they leave the coloring room. This is essential in all tannages, but more particularly in chrome. As a general thing in all vegetable tanning, the color, if it has faded more or less on the grain, can be doctored up in the seasoning, since the pores of the grain are, in this tannage, kept open and the color kept from smutting by the use of flaxseed and the like. The flaxseed not only helps to hold the seasoning but brings out a higher gloss when the grain is glazed. In the chrome tannage this is not the case, as the pores of the skin have been contracted in the tanning, and the contraction will be much more pronounced after the leather has been dried. A deep, rich color must be produced on the grain while it is wet. Care also must be taken that the grain is not drawn.

It is well known in all morocco factories that skins tanned in bark, being of a brown color, take the coloring material more readily, and when put into blacks or the dark fancy colors a better color is developed than when the skins have been tanned in sumac.

In the chrome tannage a pale green color is developed, which in itself is a poor bottom for any color, and to change this many kinds of vegetable tannin have been resorted to. Some have used sumac and extract of hemlock bark, and others gambier and quebracho. These

have had a tendency to upset the appearance of the leather, producing an appearance of combination rather than of chrome tanned.

CARE IN USE OF LOGWOOD.

Chrome leather is very susceptible to the action of tannic acid, drawn grain frequently resulting. Logwood contains a large percentage of tannic acid and to try to color chrome tanned leather with fresh logwood is extremely wasteful. In the chrome tannage the chromic acid is reduced to oxide of chrome. The lake forming agent in this case is the pale green oxide of chrome. The form of logwood which will give satisfactory results on such a surface with non-oxidizing mordants is Haematein. In using Haematein care must be taken that it is not used too strong or the grain will be drawn and pores closed, so that it is almost impossible for any seasoning to enter.

THE COST OF FINISHING

and the appearance of the finished leather depends upon the manner in which the coloring is done. Some manufacturers bring their leather from the coloring room a deep, rich black, open-pored and clean. With others, although the grain is black, the pores are closed and the free dye not properly rinsed from the grain. Such colored stock cannot take in any seasoning, and what seasoning is applied to the grain "plys" after being glazed leaving a muddy bottom underneath. When such finished leather is made into shoes and the shoes dressed they have a plastered appearance.

Shoe uppers are handled many times in going through the different departments of a shoe factory, and finish that easily rubs off when handled soils the linings and damages the appearance of the shoes. The finish on leather may dull a little in handling, but if properly colored and seasoned it will not smut, and when the shoes are dressed the bottom is there and the dressing quickly penetrates.

IN FINISHING CHROME-TANNED LEATHER

made from hides it cannot be called currying, as no heavy stuffing with hard grease is used, since the leather made from this tannage cannot carry or absorb it. The leather is finished more like morocco finish, being colored and fat-liquored when wet, instead of being dried and dampened. After the chrome leather is colored and fat-liquored it is put out on the machine and hung up to dry. When dry it is dampened in sawdust for staking. After the leather has been well softened it is tacked on frames to take out all stretch and left to dry. When dry it is ready to receive the finish. If for bright or dull-finished

leather is measured and finished in bright, dull, smooth, pebbled, or [illegible] finish. Consequently chrome-tanned leather made from hides is bleached after being tanned by first using borax and then a weak solution of sulphuric acid and water. The borax opens and softens the leather, and being alkali prevents the acid from doing any injury. This bleached leather is used for a great many different purposes, such as basketals, belts, suspenders, etc. Perhaps sheepskins more than any other class of stock are being tanned and bleached in this manner.

CHROME-TANNED SHEEPSKINS FOR APRONS.

Blacksmiths prefer aprons made from sheepskins tanned by the chrome process. One blacksmith told me that it was his opinion that his apron would never wear out; that neither hot sparks nor the wear of horses' feet seemed to make any impression on it. It is the only leather made that will not become hard when subject to the action of salt water. Such leather has long been needed by sailors for use on the mouthpiece of fog horns. The leather that is in common use gets very hard and stiff, making it necessary to wet it each time before using. In the chrome tannage this difficulty has been overcome. This chrome process is something of an evolution as well as a revolution.

HOW CHROME LEATHER IS MADE FOR USE IN TROLLEY CARS.

That there must be a large field for the use of leather in the electric cars of today there is no doubt, and chrome-tanned leather is the ideal leather for that purpose on account of its being able to withstand all kinds of climatic conditions without deteriorating.

BELL CORDS.

Take the bell cords that were formerly made of bark-tanned leather. They are now made of rope, and the reason for this is that the cords made from the bark leather did not wear long enough. They became dry and broke very easily. A bell cord made of chrome leather would last as long as the average electric car. Next take the hanger straps. It is a common thing to see them pull apart when they appear to have been used only a short time. The amount of leather used in the modern electric car for bell cords and hanger straps is 22 feet. It is easy to see that there is a nice business in store for the tanner who can get this trade. It will not be necessary to have the bell cords of round leather. They can be made of flat strips three-eighths of an inch wide and will be plenty strong. The reason why bark-tanned bell cords are round is because they would not be strong enough if made flat in ⅜-inch strips, so they were cut ½ inch wide and ⅜ inch thick, then wet and rolled to make them round and firm. A chrome leather

bell cord ⅜ inch wide, cut from 5-ounce leather, will stand three times as much work as bark-tanned straps cut from 5-ounce leather and ½ inch wide.

HANGER STRAPS.

When it comes to the hanger straps, a chrome strap ⅞ inch wide will outwear three bark leather straps 1¼ inches wide. They will always stay soft and will be much more easy to hang onto. Some cars have what is known as the folded or padded strap. It is made from thin, soft leather cut 3 inches wide, 3 feet long and folded together with a piece of webbing for a filler. The edges of the strap are brought together in the center of the webbing, and a strap ¾ inch wide stitched over the lap the full length of the strap. There is a buckle and loop on the end. This class of strap can be made from the thin parts of the leather, so the entire side of leather can be worked up with practically no waste left. To make this kind of leather the tanner would have to use a 40 to 60-pound buff hide. This weight of hide would give him bell cords from the back, strap hangers from the center parts of the side and the fold straps from the bellies.

THE BEAMHOUSE.

To make hides of the above weight into leather suitable for this class of leather the tanner would have to pick out plump hides. Spready hides would not do. They should be worked through the beamhouse as follows: Soak 48 hours; split up the back and flesh; then soak 24 hours more, when they would be ready for the limes. A straight white lime system should be used. Fourteen per cent of lime is the amount required for the first pack and 12 per cent for packs following. Divide the lime into a six-days' system, as follows: For the first pack first day use 3 per cent of lime; the second day, 3 per cent of lime; third day, 2 per cent of lime; fourth day, 2 per cent of lime; fifth day, use 2 per cent of lime; sixth day, 2 per cent of lime. In the winter-time, when the water is cold, warm the last two limes up to 75 degrees temperature. Put the hides into warm water 85 degrees one to three hours before unhairing. The second and following packs should be handled the same way as the first, except 2 per cent of lime should be used on the first and second days. The limes should be cleaned every four weeks in the summer and every six weeks in the winter.

When the hides have been unhaired on a machine they should be washed in a mill with running water for fifteen minutes, then put into warm water 85 degrees for one hour and worked over the beam by hand to work out the fine hair and gurry. This working by hand is very essential, as it puts the hide in proper condition for the bate to do

the work. A man must not expect to have his bate work properly when the pores of the hide are filled with dirt, as the dirt clogs the action of the bate. Some tanners will say that it costs too much to work the hides by hand. A man paid $2 per day will work in first-class shape 100 sides per day; that is 2 cents per side. The sides will average 23 feet. Figuring it out per foot it is so small you can hardly find it, and the results are so much better it will really make money if you paid the man $2.30 per day.

BATING.

When the hides have been worked on the beam they are ready for the bate. A bacterial bate should be used, as a soft, fine grain is what is wanted. Chicken manure is the first thing the average tanner looks for when a bacterial bate is mentioned. He uses that because our grandfathers did, and they used it for the same reason our great-grandfathers used tallow dips for light—because there was nothing else to use. But the tanner of today does not have to use anything so filthy as manure. He can buy a commercial bate that will do the work and put the hides in the same condition as manure, with the exception that it will not fill the hide full of foreign matter that he has worked for days to take out. The hides can be depleted or not, and uniform results can always be gotten, which is not the case with a manure bate. Even an offensive odor can be gotten from the commercial bates. The manufacturers of these bates do not try to sell their bates and claim they do not stink, for they know that to get a bacterial action some unpleasant smell must go with it. If a manure bate is used you will have to give a bran drench to clean them of the filth of the manure. If a commercial bate is used all that is necessary after bating in a wash of five minutes in wash wheel. I am not selling any bating material, neither am I interested in any company that makes it, but I cannot see why a tanner should soak, lime, wash and beam his hides or skins to get rid of filth and dirt, then put them into a bating material, 80 per cent of which is dirt and filth.

PICKLING.

When the hides have been bated and washed they are ready for the pickle, which is made up in a paddle wheel as follows: Use to each 100 pounds of hide, weighed after bating, 16 pounds of salt and 7 pounds of alum. Run the hides in this alum and salt bath four hours and allow them to remain in it over night. The next day run them one hour and take out and horse up for three days to drain. Now take six pounds of bichromate of potash to each 100 pounds of the hide, weighed after draining from the pickle, and dissolve it by boiling

in four gallons of water. When it is dissolved add cold water to make fifteen gallons, and at the same time bring the temperature down. Put the hides in a mill and put in the bichromate solution, and run the mill four and one-half hours, or until the chrome solution has struck through the thickest part of the hide. Then take them out and horse up to drain for forty-eight hours. Next dissolve by boiling eighteen pounds of hyposulphite of soda in ten gallons of water and cool down by adding five to eight gallons of cold water. Put this hypo solution in the mill and put in the hides, then take four pounds of muriatic acid to each 100 pounds of hides and put into the mill. Put in the door and start the mill. Run it four to six hours, or until the hides are a chrome blue all through, then horse them up for twenty-four hours, when they are ready to wash.

WASHING AND SHAVING.

The washing is done in a paddle wheel with running water, and they must be washed until they are entirely free from acid, which will take from six to nine hours. After they are washed they are pressed and shaved. This same kind of leather can be made with the single bath system of tanning at less cost of labor and material, so I am told, and the firms selling the single bath liquors will furnish full details for making leather with their goods.

FAT-LIQUORING.

When the leather is shaved it is ready for the fat-liquor. The fat-liquor is made up from the following formula: Four pounds of moellon degras, two pounds of neatsfoot oil, two pounds of wool grease, one and one-half pounds of chip soap, eight gallons of water. Mix up and boil together for forty-five minutes. Then add one-half pound of tanners' soda and stir well. There should be about fifteen gallons when all finished. Use at a temperature of 165 degrees. Run the stock in the fat-liquor for forty minutes, then drain off the exhausted liquor and put in ten gallons of warm water, to which has been added one pint of ammonia, and run ten minutes, then drain again. Now put in four pounds of gambier, which has been dissolved in fifteen gallons of water. Run in this gambier liquor one hour, then take out and set on the grain, and hang up to dry. When dry the rough spots can be buffed off and the leather is ready to finish.

FINISHING.

The finish is made by boiling one-half pound of Irish moss, one-half pound of starch, one-half pound of soap and one pint of olive

oil in six gallons of water for thirty minutes. Allow to cool and strain, then add water to make eight gallons in all. Give the leather a liberal coat of the finish, and when the finish is well struck in stake the leather on the flesh side and then roll and hang up to dry. When it is dry give it a second coat of finish and dry. When dry, roll again. The leather should not be hung over sticks to dry. It should be tacked out on frames but not stretched. Care should be taken not to allow it to dry after staking and before rolling. If it should get dry, give it more finish and roll while damp.

MANUFACTURING CHROME BOX CALF.

In manufacturing chrome box calf, to get at the cost of labor and stock of chrome calf from twelve to sixteen pounds, take the labor and stock used in each department, beamhouse, tan yard and curry shop. Keep an itemized account of each to get the exact cost, and when you get through add up each and then take the amount of leather in feet and divide that with the cost of labor and stock used to get the cost per foot.

One hundred pounds of green salted stock put in chrome will produce from 90 to 95 feet of leather and a 12 to 15-pound skin can be put through for 4 cents per foot for labor and stock. This is the cost laid down on the counter, but a fair margin should be allowed for incidental expenses which no man can avoid.

This estimate of cost covers everything at the tannery with the exception of rent, interest and freight. When tanners first began to work on chrome they were very short on the measurement, but now have got it down finer and are improving all the time.

The trouble was, and in some cases is yet, in the tanning. The skins were drawn and puckered, the chrome took too strong a hold, making the leather shrink, and the same trouble occurred in the hyposulphite process, making the stock unnaturally plump and short-fibered. The leather had a tendency to make cracky grains, and, of course, there was a loss in measurement. By using a small amount of salt or running the stock in a salty bath a few minutes before giving the chrome this trouble will be avoided.

After you have run the stock in the salt water, say, ten minutes, using half a barrel of water and a half pail of salt, if you are employing the straight two-bath process, draw off the salt water and then use your chrome. If you have what is called the pickle process—that is, your stock is run in acid and salt pickle, only using the chrome in the first process—it is a good plan to leave the salt water in the drum and not use as much water, only one-third of a barrel. In this tannage you use no acid in the chrome or hypo, as you will have sufficient acid to carry through.

Another place of losing measurement is in the tacking out. The skins should be drawn fairly tight on the boards and not dried out too quickly. It is much better to take a little longer in the drying and you will get a softer piece of leather and one that will work up better.

NEW FIELD FOR CHROME SPLITS.

A new field for chrome splits has opened in the manufacturing of leggins. Heavy chrome splits made with a small per cent of fat-liquor is finished with a coat or two of waterproof dope, and embossed. When made into leggins it is found to wear better, will shed water and stand hard knocks better than anything ever made into a leggins, such as hunters, civil engineers and automobilists use. The splits can be finished into any color. There is a dope on the market that anyone can use. It does not require any ovens to use it and it is put on with a brush. Another use for chrome splits is for straps on canvas leggins. When the canvas leggins first came on the market they used a bark leather strap, but it did not last long enough, as it would get wet and dry hard and break. Now the chrome split is given fat-liquor, dried and dry milled, when it is ready to cut into leggin straps. However, only the heavy splits are used. The light ones are put into mitten stock. Another place for light chrome splits is for cheap shoe gussets. The splits are blocked, fat-liquored with 5 per cent of cheap Moellen degras, then dried and milled in a dry mill for about three hours; they are then measured. Still another outlet for medium chrome splits is to black fat-liquor with a cheap fat-liquor. Set dry stake and give a coat of paste, made of fish glue, flour soap and colored black with nigrosine. When dry emboss. They are used for cheap shoe tops.

BLUE BACKS FOR CHROME SIDES.

Dissolve one pound of logwood crystals for each 100 pounds, shaved weight, by boiling; have twelve gallons when done. Use at a temperature of 110 degrees Fahrenheit. Run twenty minutes. In the meantime dissolve four ounces alum in three gallons. When the twenty minutes are up put the alum solution in the mill and run ten minutes, then add the following strike: Two ounces copperas, one ounce bluestone dissolved in three gallons water, cool to 85 degrees, put in mill and run ten minutes, drain and wash ten minutes, and they are ready for fat-liquor. This will give a nice black on the grain to finish on and a blue back.

TO COLOR CHROME-TANNED CALFSKINS A DEEP BLACK.

Wash the skins until they are perfectly free from acid, then shave them and for each 100 pounds of skins, shaved weight, dissolve one and one-half pounds of logwood crystals by boiling in eight gallons of water. When dissolved add cold water to make twelve gallons of liquor, then dissolve four ounces of extract of fustic paste in two gallons of water and add to the logwood liquor and stir well. Take the skins from the shaving machine and put them into color mill. Put in three gallons of water to each 100 pounds of skins. Run mill ten minutes to wet the skins. Then put in the logwood liquor at a temperature of 120 degrees Fahrenheit. Run the mill twenty minutes. In the meantime dissolve one ounce of bichromate of potash to each 100 pounds of skins in a small amount of water. Add cold water until it is cold, and add to mill and run the mill ten minutes. Then drain the mill and wash the skins in three changes of warm water. The skins are then ready to fat-liquor. This washing must be done or the fat-liquor will not go in. Add to the logwood liquor three ounces of salts of tartar for each 100 pounds of skins.

RETANNING LIGHT CHROME CALFSKINS.

When a tanner has a lot of very light chrome calfskins that he would like to put into a M. L. instead of a L. or L. L. weight he can do so by the following method: Take skins after they have been tanned in chrome and horsed up twenty-four hours; wash them to remove all acid, then fat-liquor just as if they were black. Be sure the fat-liquor goes in nice and clean. After they are fat-liquored put them into a tanning mill and give the following retain liquor: Four pounds of gambier dissolved in six gallons water, then add six gallons of cold water to cool; run skins in this gambier solution three-quarters of an hour. This amount is for 100 pounds of skins as they are weighed for the chrome tanning. After they have run three-quarters of an hour they can be put out shaved and stained. In fat-liquoring before retanning there will be no danger of drawing the grain or causing the leather to be tender. Skins treated this way can be colored for fancy colors without any ill effects of the fat-liquor throwing the color.

TO MAKE CHROME COLORED SIDE LEATHER.

To make good chrome colored side leather a good plump hide must be used, one that is clean on the grain and not over thirty-five pounds

in the hair. It is a great mistake to try to imitate a calfskin with a hide that weighs fifty pounds, as some tanners know to their sorrow.

Take the hides in the hide house and trim off tails, shanks and pates. Hang them in the soaks twenty-four hours and then take out and split into sides and return to the soaks for another twenty-four hours and they are then ready to flesh on the machine. After they are fleshed put into a soak of clean water over night and in the morning start them through the lime as follows: In the first lime pit use 1½ per cent of lime and allow hides to remain in twenty-four hours, then reel into second pit, using 2 per cent of lime, and allow to remain twenty-four hours. Reel into third pit, 2 per cent lime, and allow to remain there twenty-four hours; reel into fourth pit, using 2 per cent lime, and allow to remain twenty-four hours; reel into fifth pit, using 2½ per cent lime, and allow to remain twenty-four hours; then reel into sixth pit of warm water, 90 degrees, and allow to remain three hours, when they are ready to unhair. This will make 10 per cent lime in all.

LIMING.

In some tanneries the amount of lime will vary on account of the water used. The limes must be cleaned out every five weeks. After the hides are unhaired on the machine they are washed in a washmill, using warm water 85 degrees for fifteen minutes. They are then placed in warm water and worked by hand over the beam for short hair. It is very essential that all the fine hair be removed when making grain-finished leather. After the leather is fine-haired it is placed in cold water over night to harden. In the morning it is ready to split, providing it is to be split out of the lime. In splitting from the lime a six-ounce weight from the machine will finish up four and one-half ounces of leather. In other words, hides worked through the beam-house by this system will fall one and one-half ounces of going through the different processes up to the time it is finished. After they are split they are run in a wash wheel fifteen minutes with cold water to open them up and remove the glaze that is caused by the belt knife.

BATING.

After they are washed they are bated in a paddle wheel, using some kind of a bacterial bate, such as hen or pigeon manure, or some of the commercial bacterial bates, but do not use a bate that will leave the hides in a puffed or swollen condition or you will have loose leather. If a manure bate is used, soak the bate in warm water 120 degrees for three days, then strain it to remove all foreign matter. Use the liquor from one bushel of hen manure for 100 grains for the first bate; after that use half of the first amount for each 100 grains. Heat the

bating liquor to 90 degrees before putting in the hides, run for half an hour and allow them to rest one-half hour, then run the paddle for fifteen minutes and they should be ready to come out. The first pack will require a little more time to bate, and will never bate as well as the packs following. Directions for using commercial bates are furnished by the people manufacturing them. They give very good results and are more uniform than any manure bate.

PICKLING.

If it is more desirable to split the hides from the pickle, take them after they are fine-haired and put them in the bath and use again as much time and bating material as you would use if you were bating the split grains. After they are bated wash them in warm water for fifteen minutes and they are ready for the pickle, which is made as follows: For each 100 pounds of hide dissolve three pounds of alum and eight pounds of salt, then add enough cold water to make fifteen gallons. Run the hides in this pickle for an hour and horse up nice and smooth over night. In the morning hang up to sammy for splitting or press and dry-mill to remove the press marks and split. In splitting pickled stock split the grains at the same thickness as you wish the finished leather to be, as it will not fall away like hides split from the lime. After the grains that were split from the lime are bated put them in a wash wheel and wash in running water ten minutes, when they are ready to pickle as follows: To each 100 pounds of grains, weighed after they are split, use one pound of sulphuric acid and eight pounds of salt dissolved in twelve gallons of water. Place grains in the mill and put in the pickle as fast as possible and run mill for half an hour, then take them out and horse up to drain over night. The grains that were split from the pickle are placed in a wash mill and washed fifteen minutes in cold water to remove the alum. They are then put in the tanning mill with five pounds of common salt to each 100 pounds and ten gallons of water and run for fifteen minutes. They are now ready to tan. After the grains that were split from the pickle are horsed up over night they are placed in the tan mill with six pounds of salt and twelve gallons of water and run ten minutes, when they are ready to tan.

THE ONE-BATH PROCESS.

The tanning of the hides that were split from the lime and the hides that were split from the pickle are identical and is done as follows if the one-bath process is used (which is the best for colored leather, as there is no free sulphur in the leather to interfere with the dye): Take ten to twelve pounds of concentrated one-bath tan liquor

for each 100 pounds of grains and dissolve it in warm water, about four gallons. Start the mill going and feed one-quarter of the tanning liquor to the leather through the gudgeon of the mill and run mill fifteen minutes. Feed another quarter of the tanning liquor and run for half an hour. Feed another quarter of the liquor and run fifteen minutes, then feed the last portion of the liquor and run until tanned, which will take about five hours after the last quarter of the tan liquor has been put into the mill.

HIDES MUST BE THOROUGHLY TANNED.

Be sure the hides are thoroughly tanned before removing them from the mill. If they are not sufficiently tanned to be removed at quitting time, add enough cold water to the mill of leather to cover the hides and run the mill for five minutes after adding the water in order to thoroughly mix the water with the liquor in the mill. Then stop the mill and push the leather under the liquor as much as possible and allow it to remain all night. In the morning run the mill for an hour, then remove the leather and horse up smooth for twenty-four hours. If the double-bath tan is preferred, the leather can be tanned as follows: Take the hides after they have been horsed from the pickle for twenty-four hours and weigh them, then for each 100 pounds dissolve five pounds of bichromate of potash by boiling in a small amount of water. When dissolved add enough cold water to make fifteen gallons. Into this chrome solution put one pound of sulphuric acid. Place the pickled grains in the mill and put in the chrome solution and run the mill three and one-half hours, then take out the grains and horse up smooth twelve hours.

RUBBER GLOVES MUST BE USED.

Rubber gloves must be used when handling the hides in the bichromate of potash liquor, as it is poisonous and will make the hands sore. After the hides have been horsed up twelve hours dissolve eighteen pounds of hyposulphite of soda by boiling in four gallons of water, and when dissolved add sufficient cold water to make fifteen gallons. Put the hides into the mill and then add the hyposulphite solution and put on the door. In the meantime take three pounds of sulphuric acid and dilute it by adding three gallons of cold water. Now start the mill and when it has run five minutes add the acid solution through the gudgeon of the mill and run three hours. They are then ready to take out and horse up over night. Never allow the hides to lay over night in the mill when they are in the bichromate of potash or the hyposulphite solution, as either will cause a drawn grain. Start each operation early enough in the day so as to finish it before quitting for the night.

HANDLING.

After the leather is tanned with either the single or double bath it is handled just the same. It is placed in a wash wheel that has plugs in it so as to make a tight mill, and to every 100 pounds of leather, weighed after it has been pressed and shaved, use a pound of borax and fifteen gallons of cold water. Run the leather in the borax solution for half an hour, then remove the plugs and turn on the running water and wash thirty to forty-five minutes. After they are washed they are ready to be treated with the following acid fat-liquor: Take an earthen jar and place it in a tub containing cool running water. It is quite important to keep the temperature of the oil as near 65 degrees Fahrenheit as possible. This earthen jar must be large enough to hold at least twenty-five gallons. Take forty pounds of good neatsfoot oil and twenty pounds of cod oil and put into the earthen jar. Do this the first thing in the morning. Now take twenty-eight fluid ounces of sulphuric acid, 66 degrees, and add very slowly, stirring well until it is thoroughly incorporated with the oil, which should take about twenty minutes. Allow it to stand until about 4 o'clock, when you add twenty-eight ounces more of the acid, stirring thoroughly same as first time. Now allow it to stand until next day, when you again add twenty-eight ounces of acid. Do this the first thing in the morning, stirring same as before. Allow it to stand until 4 o'clock, when you again add twenty-eight ounces, stirring well. This will make 112 ounces of acid altogether. Next morning the oil is ready to be washed and to do this you must have a tub that will hold about 100 gallons of water, into which a spiggot must be put as close to the bottom as possible. Place the tub on a small elevation. Now take what is in the earthen crock and pour it into the tub. Add water to make the tub half full (have water 100 degrees) and stir well. Add one and one-half parts of glaubers salt and stir hard, then add more water until tub is full. Allow this to stand until the evening of the third day, when the spiggot is opened and the water turned off until the oil begins to show. Close spiggot and fill up tub same as first time with warm water and add one pail of glaubers salt. Allow to stand until next day and then draw off water same as first time. Fill again with warm water and use one and one-half pails of common salt. Stir well and allow to stand for twelve hours, when you draw off water and fill tub with warm water and use one and one-half pails of common salt. Stir well and allow to stand until next day, when you draw off water until oil starts to run. Close spiggot and the oil that remains is ready for use.

FAT-LIQUORING.

All that has to be done in fat-liquoring now is to use the required amount of oil and dilute in sufficient water to wash the leather. The

main things in making good fat-liquor are to enter the acid slowly, stirring well at the same time, also plenty of stirring when washing out the acid and to keep the water cool in which the earthen jar is standing. To keep the acid-treated oil after you have made it add cold water, say, about twice its own weight. Before adding the water it is best to add enough strong ammonia to the acid-treated oil to neutralize the small amount of acid that is liable to remain in it and carry it to the alkaline side. It is best to use litmus paper for alkali to get the test.

In fat-liquoring chrome leathers for colors the amount of the acid-treated oil depends on the softness required, and the judgment of the operator must determine how much will give the softness he is looking for. I would say for a start to use 4 per cent of the oil based on the weight back of the shaving machine. Dilute the amount of oil required in a sufficient quantity of 125-degree water for the leather to slush freely in the drum. Before putting the skins in be sure the drum is perfectly clean. It is also essential to have the leathers thoroughly warmed up before giving them the fat-liquor. Run the leather in the fat-liquor for thirty-five minutes, then take them out and rinse them off in a tub of clean hot water so as to remove all traces of fat-liquor from the leather. This operation is necessary so that the mordant will take hold of the leather freely.

Do not fat-liquor in a drum that has been used for stuffing, blacking, pickling or tanning without thoroughly washing and cleaning with sal soda. When you have a clean drum, clean leather and plenty of water is used to dilute the oil, there will be no trouble in getting in the fat-liquor. After the leather is fat-liquored and rinsed, horse up smooth over night and in the morning it will be ready for the mordant and the color. The mordant to use is fustic and gambier. To each 100 pounds of leather, shaved weight, take two pounds of gambier and one pound of extract of fustic. Dissolve it in three or four gallons of water and cool down with cold water to make twelve to fifteen gallons. After the leather has been horsed up over night from the fat-liquor, put it in a perfectly clean mill with the gambier and fustic liquor and run the mill forty minutes. The spent liquor is then drained off and put into the mill with fifteen gallons of warm water, 140 degrees, and run the mill ten minutes and the leather is ready for the dye.

DYEING.

The writer will not attempt to give any directions for the dye, as there are so many different shades of leather made and there is such a large assortment of dyes that it would be impossible to give directions which would answer for all the shades. The dealers who sell the colors will furnish directions for using their dyes and will match colors. After the leather is colored take it from the mill and dip it in

a tub of clean cold water, one side at a time, and horse it up over night. The next day set it on the grain, using a brass or rubber slicker. Give the grain a very light coat of oil, as sperm or olive oil, and hang it up to dry. Hang it up lengthwise, head to tail, and do not hang it over sticks. When it is dry take it down and pile it in damp sawdust over night. When putting it in the dust, place it grain to grain, in order to guard against any strain on the grain. When they have been in the dust ten or twelve hours they are staked and tacked out on frames to dry. After they are thoroughly dry they are taken from the board, trimmed and restaked.

FINISHING.

They are then ready for the finish, which is made by dissolving one pound of castile soap in three gallons of water. Cut the soap in small pieces and allow it to soak twenty-four hours, when it is stirred into a solution. Now take eight ounces of gelatine and dissolve it in half a gallon of boiling water, and in the meantime put six ounces of blood albumen to soak for twenty-four hours in one gallon of cold water, then stir it well and strain it into the soap solution and add the gelatine. Mix thoroughly and add cold water to make six gallons and stir again. The finish is then ready to use. Take the leather and give it a good heavy coat of the finish. Rub it in hard and hang it up to dry. When dry, jack on a glazing-jack, using a piece of hard felt in place of the glass. After it is jacked it is glazed and sorted.

CHROME COLORED CALFSKINS.

There has been a large run on colored calf leather and a much larger percentage of chrome tanned colored calf has been made, and as the leading shoe cutters prefer chrome colors to vegetable tanned colors, the tanners of calf leather throughout the country are preparing to make chrome tanned calf into colors. Chrome is preferable to vegetable tanned leather, because a shoe of minimum weight can be made from the chrome, while it is impossible to make a light-weight shoe from vegetable tanned stock. To prove this fact all that has to be done is to go back to the days of bark tanned wax calf and see how many ladies' shoes were made from wax calf.

COLORING.

The vegetable tannage plumps the skin. If, after plumping, the skins are shaved or split to a light substance, the leather will be tender. We are asked, Why has there been so much more Russia calf made than chrome colors? For the reason that the tanners found it was a

difficult process to get a good color on chrome and it remained for a tanner of the middle west to achieve success in this line. It is now known that a much better line of colors can be obtained on chrome than on vegetable tanned leather—colors that will not fade in the sun and colors that are brighter. The reason for this is that alizarine dye can be used on chrome leather, but it cannot be used on vegetable tanned leather on account of the high temperature required to successfully use alizarine dye. The best feature about alizarine dye is that an alkali fat-liquor can be used with it without detriment to the color. Another feature in favor of this dye is that it is inexpensive.

Tanners who contemplate making chrome colors in either sides or skins cannot start in this line without some extra expense. They must have clean mills, paddle wheels, horses, staking machines, tables, brass or rubber slickers, a brush wheel and an emery wheel. When they have these all ready they must start in the beamhouse in order to get perfect results on the sorting table, and they will not, or at least should not, expect to get first-class leather on the first lot, for it has taken tanners who are making first-class leather of this kind quite a long time to get to the top.

Take a light-weight green-salted skin to start with—a 5 to 7 pound skin is about right. If a larger skin is used there will be more difficulties to overcome. Trim off the heads and shanks, put the skins in a clean soak for 24 hours, then put in a wash mill and wash in running water for 15 minutes. Put back in the soak for 24 hours longer, then flesh on the machine and trim off all rags of flesh left by the machine. In the meantime get the lime pits ready and make up the lime for the first day as follows:

LIMING.

Slake 2 per cent of lime for each 100 pounds of skins as they weighed in the green-salted condition. Fill up the pit with water to cover the skins and add the slaked lime. Have two men working in a team; put in the skins, one man throwing them in and the other with a pole to push them under the lime liquor. Care must be taken to get them nice and smooth under the lime liquor. If they are put in and allowed to settle in the bottom in bunches, uniform results will not be obtained. Allow them to remain in the lime 24 hours, then haul out and add to the pit an additional 2 per cent of lime; plunge well and put back the skins for 24 hours longer. Haul again and add to the pit another 2 per cent of lime and one-half of 1 per cent of red arsenic. Dissolve the arsenic by adding it to the lime while slaking and put back the skins for another 24 hours. This makes the fourth day.

Haul them out, plunge up the liquor and put them back. Do not add any lime on the fourth day. On the fifth day haul and give 2 per cent of lime. On the sixth day haul, plunge the lime and put back.

On the seventh day give 2 per cent of lime and half the amount of arsenic that was used on the third day. On the eighth day they should be ready to unhair. If the weather is cold and the water and beamhouse are under 60 degrees temperature the lime should be warmed on the sixth day to 70 degrees and on the seventh day to 75 degrees.

After the skins are unhaired on the machine they should be put into a tub of water 75 degrees and worked over the beam for fine hair. After the fine hair has been worked out they are washed in a wash wheel for 15 minutes with running cold water. After the washing they are "cheeked" (the thick necks split down on a cheeking machine). It is a mistake to wash the skins before fine-hairing, for the water will wash out the lime and set the fine hair and it will be almost impossible to remove it. After the skins are "cheeked" they are ready for the bate.

BATING IN DAY TIME.

The bating should be done in the day time. It is a particular operation to bate calfskins just right for colors. Nine tanners out of ten bate too low and get a loose grain and a flaky flank. The bating should be done in a paddle wheel with a tight cover to retain the heat. A bacterial bate should be used, the old-fashioned manure bate being a good one. Skins bated in a manure bate should be given a bran drench after bating to remove all stains and clean up the skins in order that the skins will be clean for colors. There are commercial bates on the market that have a bacterial action and are used by some of the best and largest tanners in the country. The main thing in their favor is that they are uniform and clean. The firms that manufacture and sell these bates give explicit directions for using this class of goods and upon request will send a man to demonstrate their goods gratis.

If a manure bate is used chicken manure is as good as any. It should be soaked four days, putting 2 bushels into a barrel with water 140 degrees. Stir the manure vigorously every day. When it is ready to be used it must be strained with a strainer made of galvanized wire, ¼-inch mesh. Make the strainer to fit over the barrel and the manure can be worked through it without much labor. For a paddle 9 by 7 feet deep the straining of 2 bushels of manure should be used to start a new bate. Of the size mentioned, 200 skins can be bated at a time without crowding. It is a bad practice to crowd skins in the bate.

To start the bate, warm the liquor up to 90 degrees Fahrenheit in the winter and 80 degrees in the summer. Put in the skins, close the paddle to retain the heat and run the paddle an hour, then allow to rest 2 hours and run one-half hour longer. The skins should be bated 3½ hours, but with a new bate it will probably take 4½.

For packs after the first, 1 bushel of manure should be enough. The amount depends upon the condition in which the manure is. If it is in first-class condition the amount mentioned here will be plenty. The great drawback about a manure bate is that it does not run uniform. To tell when a skin is bated right must depend upon the man in charge of the beamhouse. There is no hard and fast rule to go by. When a bran drench is used a bushel of bran is soaked over night in a barrel of warm water 110 degrees. The day after the skins are bated in the manure they are put into a paddle of clean, warm water 90 degrees and the soaked bran added to them and run for 15 minutes and then let stand for 1½ hours. Run 15 minutes longer and take out, put in a wash mill and wash 10 minutes in cold running water, when they will be ready to pickle.

PICKLING.

The pickling should be done in a paddle wheel and it should be made up as follows: For each 100 gallons of water in the paddle tub use 65 pounds of salt and for every 100 pounds of skins use 1½ pounds of sulphuric acid (oil of vitriol). Be sure that the salt is dissolved and the acid thoroughly mixed with the salt water, then put in the skins and allow to run one hour and remain in the pickle liquor until the next day, when they are taken out and horsed up to press and drain for 24 hours. In horsing up, put grain to grain.

TANNING.

The next operation is the tanning, and for colors the best system is the one-bath tannage, as there is no trouble with sulphuric to overcome or bleach out the dye after the leather is colored. There are a number of recipes for making one-bath liquors to be had for the asking, but if one has not a thorough knowledge of chemistry he is running a great risk in making tan liquor. It would be much better for him to buy his liquor from some good, reliable firm manufacturing and selling chemicals. The firms selling chrome tan liquors furnish directions how to handle the same.

After the skins are tanned and horsed up the required length of time, press them, or put out on a machine for shaving. When shaved put them in a closed mill and for every 100 pounds weighed after shaving dissolve 1½ pounds of borax in 15 gallons of water 90 degrees warm. Run the skins in this borax water 30 minutes, then place them in a wash wheel with running water and wash 30 minutes, when they should be clean of all acid. If they show any trace of acid they must be washed until perfectly clean. After they are clean they should be given a light re-tan of gambier, using 2 pounds of gambier

to each 100 pounds of skins. Dissolve the gambier by boiling and coat down by adding cold water so as to have 12 gallons to each 100 pounds of leather. Run the skins in this gambier 45 minutes to 1 hour. After this re-tan the skins are ready to color.

SOME TANNERS RE-TAN.

Some tanners re-tan their skins before shaving, but it is best to shave first, as it saves re-tanning the shavings and it makes a better back, for if you re-tan and then shave it will cut through the re-tanning and have spots of the natural chrome, blue and yellow spots of the re-tan, and when you add the dye it will take stronger on the re-tanned spots and give you a mottled back, and the appearance of the backs of skins goes a long way when it comes to selling them.

Another thing to keep in mind when making colored skins is that a certain per cent of the output will have poor grains and those skins can be finished up into ooze leather and sold at a nice profit. Some tanners work a lot of dry skins along with their green-salted skins and out of the dry skins they get quite a large number of skins that will work into colors. The remainder they put into blacks and ooze.

DYE MANUFACTURERS WILL MATCH COLORS.

When starting to make colors it is very difficult to get the right shades. In order to save a lot of trouble and time, the formula for any color desired can be obtained by sending a tanned skin to any of the large firms selling dyes. Take the skin just as it comes from the gambier bath, send it while wet, also send some samples of the colors desired to be made. The dye manufacturers will match the colors and do it gratis. Of course, you are expected to purchase your dyes from the firm you get your colors from after you have a line on your colors. It is an easy matter to make changes and get almost any shade desired.

MAKING FAT-LIQUORS.

In making fat-liquors you must know what kind of dye you are using. If an alizarine dye is used, an alkali fat-liquor must be used. A good one for colors is made of 8 ounces of Peerless oil soap, 2 pounds olive oil, 2 pounds treated cod oil boiled hard for half an hour, then add 2 ounces of birch oil. Stir well and then add 3 ounces of salts of tartar dissolved in 2 quarts of water. Add water to make 12 gallons; use at a temperature of 160 degrees. This amount is for 100 pounds of skins weighed after shaving.

For a basic aniline dye take 2 gallons of hot water and dissolve 4 ounces of salts of tartar in it, then add to the tartar water 3 pounds

of No. 1 moellon degras and stir well. Add water to make 12 gallons and use it at a temperature of 140 degrees. This amount is for 100 pounds shaved weight. If an acid dye is used an acid fat-liquor must be used. Acid fat-liquor can be made in the tanning, but it is a long, tedious operation and requires a great deal of vigilance. Acid fat-liquor can be bought almost as cheaply as it can be made.

USING ACID FAT-LIQUORS.

In using acid fat-liquor, 1¼ pounds of it must be used where 1 pound of any other oil would do. After the leather is fat-liquored, take it from the mill and have a tub of clean, warm water, 100 degrees temperature. Dip each skin into the water and horse up grain to grain. Drain over night. The next day set out on a clean table, using a brass or rubber slicker. Set on the flesh and then on the grain. Wipe off the grain with a light coat of glycerine and water, using 1 part glycerine to 3 parts water. Hang the skins up to dry on hooks—do not hang over sticks. When dry, allow to lie in the crust a week and then damp in sawdust or dip in warm water and pile down 24 hours. When in proper condition stake and be sure the staking machine is perfectly clean. When staked, tack out on a board to dry. Use tinned tacks when tacking and be careful that no marks of the pliers are left when tacking. When the skins are perfectly dry, take from the frames and buff the flesh side on the emery wheel. Then trim the ragged edges and the skins are ready for the seasoning.

SEASONING.

The seasoning is made by boiling 8 ounces of flaxseed in 2 gallons of water for half an hour. While boiling add one-half pound of ivory soap cut up fine. When boiled the required length of time, allow to cool and then strain. Now dissolve 4 ounces of good gelatin in a quart of boiling water and add to the soap and flaxseed solution. Mix well and add enough water to make 6 gallons. Give the skins a good coat of the seasoning and hang up to dry. When dry, run on the brush wheel, using just enough pressure to bring up a light gloss, then roll on a rolling jack, using a light pressure, when the skins are ready for the sorting table.

If you have hard water, be sure and boil it before trying to make your colors, as hard water is a difficult proposition when it comes to colors. If an acid fat-liquor is used, the leather will absorb water much more rapidly than if an alkali fat-liquor is used. Do not use any more gambier than instructed, as too much will make the leather tender on the grain.

GLAZED CHROME SIDE LEATHER.

Chrome tanned sides intended to be worked into glazed shoe leather may be worked, after tanning, through the following process: As the sides come from the tanning liquors, either one or two bath, wash them very thoroughly for twenty minutes in water to which some borax has been added, say about one-half pound of borax for each 100 pounds of stock, as it was weighed before tanning. Then wash them from twenty to thirty minutes in clear cold water. This thorough washing is for the purpose of washing out all alum, salt and tanning materials, and puts the leather in good condition for finishing. After the washing is completed, the sides should be struck out on a striking-out machine, or they may be pressed in a press and as much of the surplus water as possible removed from them. If the sides require it, they should be shaved next and made of uniform substance and smooth and clean upon the flesh side.

It improves the quality of chrome sides to give them a treatment with palmetto extract. The grain is made very solid and smooth by such treatment and the leather carries the color better. For 125 pounds of leather, weighed after shaving, use about one pint of the extract dissolved in warm water at a temperature of 90 degrees and run the leather in this liquor in a drum for twenty minutes, then proceed to color and fat-liquor it.

COLORING THE FLESH.

The next operation is the coloring of the flesh. This may be done by using a logwood liquor, or blue nigrosine may be used. A good flesh-coloring liquor is also made by boiling five pounds of Hemolin X S for a few minutes in fifty gallons of water, and adding to this liquor about three pounds of borax or of sal soda. When used for flesh coloring as well as grain blacking, this liquor is applied to the sides in a drum, and after the leather has been run therein for fifteen minutes it is spread on a table or run through a machine and the striker or blacking applied to the grain. This method leaves the back of the leather blue and the grain black.

A GOOD STAINING LIQUOR

is also made by taking about thirty gallons of ordinary logwood liquor and adding to it three ounces of purple and two ounces of black aniline, and applying the liquor at a temperature of 125 degrees. In using blue nigrosine upon chrome sides, use about eight ounces of the dye for each dozen sides, at 120 degrees. Run the sides in the color for twenty minutes, or until the color is well taken up, then

draw off the water or press the sides and fat-liquor them; then take the stock and black it upon the grain with logwood liquor and striker.

The leather may be blacked upon the grain before fat-liquoring or afterwards, as may be preferred, but the water must always be well struck out and the leather made as dry as possible before any fat-liquor is applied, if best results are wanted. A very good article to use in making a fat-liquor for chrome sides is Palermo fig soap. This material is combined with oil and degras and feeds and nourishes the leather very satisfactorily. Upon glazed leather only the best quality of oil should be used in order that there will be no trouble with greasy grain after the leather is finished. A very good fat-liquor is made as follows: Put ten pounds of Palermo soap into a clean barrel with about ten gallons of water. Turn on steam and boil and stir the soap until it is all dissolved. A steam mixer is very useful for this purpose. Then take four gallons of neatsfoot oil and cut the same by pouring into it and mixing a few ounces of borax or of sal soda dissolved in hot water. Pour the oil into the soap solution and stir both thoroughly together. Add six pounds of moellon degras and, after thoroughly mixing the three ingredients, run in enough water to make a total volume of fifty gallons of fat-liquor. Use this fat-liquor at a temperature of 125 degrees. The quantity of fat-liquor required by a lot of leather depends upon the degree of softness desired, and must be determined by the workman attending to the fat-liquoring. A suitable stuffing-drum is heated with live steam and the leather, drained and pressed, is thrown in and run in the drum until it is warmed through. Then the fat-liquor is added, a gallon or two at a time, through the hollow gudgeon of the drum, and run the leather in the liquor for forty minutes. At the end of this time the fat-liquor will have been fully absorbed by the leather and nothing but water will be left in the drum. The leather should then be thrown in piles or laid over horses for twenty-four hours, so as to give the grease time to penetrate into and nourish every fiber. Some tanners prefer to buy a fat-liquor to making one, and such materials of very good quality can be bought ready for use, requiring only the addition of hot water.

STRIKER.

A good "striker" to develop the logwood is made as follows: Dissolve 4½ pounds of copperas and 1½ pounds of blue vitriol in half of a barrel of water. Boil until dissolved. Fill the barrel with water. If the sides are run in logwood in a drum and the striker applied by machine, dissolve 12 pounds of copperas and 4 pounds of blue vitriol in a barrel of water. To the above add 1½ pounds of nutgalls and 1 pounds epsom salts to each six pounds of copperas and blue vitriol combined.

When the sides are colored upon a table after fat-liquoring, a small quantity of ammonia should be added to each pailful of dye, and two coats of dye and striker should be given, after which the leather should be rinsed off and well set out upon the grain. A mixture of glycerine and water, one part of each, is next applied to the grain and rubbed in; then the leather is again set out, and a light coat of warm oil, sperm or neatsfoot, is put upon the grain, after which the leather is dried out. Moistened in damp sawdust, the leather is staked until it is soft and dry, and it is then ready for the final finishing.

Lactic acid is very useful in cleaning the grain of grease and getting a clear and bright finish. Levant inks are a very superior class of seasonings to use in glazing. Several coats of the glazing liquor are usually required. Go over the glazed grain lightly with an oily sponge, and the leather is finished.

CHROME-TANNED SIDE LEATHER AND CALFSKINS.

The first step in the process is that of soaking. This should be carefully and thoroughly done, and all dirt, salt and blood should be soaked and washed out before the liming is begun. Only good, plump, salted hides should be used for chrome leather. After the hides are sufficiently soaked, they should be flushed and then resoaked for a few hours. The cutting into sides should be done before liming.

BEFORE BEING PLACED IN THE LIMES

the sides should be tied together in a long chain by joining the neck and butt with a rope, hook or pin, and they can then be easily reeled from one lime to another. For firm box or glazed finish the sides should not be limed very long, while for dull or mat finish longer liming will do no harm, as this leather is wanted soft and elastic. For glazed and boarded leather the sides should be limed only until the short hairs come easily and no longer. A very small quantity of sulphide of sodium may be used, although good leather can be made without it. The less the sides are limed, provided they are not underlimed, the more the splits weigh when finished and the firmer and more durable is the finished grain leather. Very small quantities of sulphide of sodium or of depilatory crystals in the lime make a fine grain and prevent, to some extent, the piping of the grain.

AFTER THE LIMING

is done there are several methods that may be followed. The hides may be split out of the lime; the grains tanned in the chrome process and the splits tanned in the bark tannage or also in a chrome process and worked out into glove leather. Or the sides can be bated and

drenched and pickled and then split out of the pickle, but this is not as good as splitting out of the limes. A third way is to bate and wash the sides, run them in a drum in a solution of sulphate of alumina and salt and then partly dry them and split them in that condition. When this is done the grains can be tanned at once in the chrome process and the splits can also either be tanned in chrome or washed out in a gambier liquor and then tanned with hemlock. No matter which way the sides are treated—the first is probably the best—the sides are bated and drenched in a lactic acid liquor more safely and better for chrome leather than in any other way.

For every hundred pounds of grains to be treated use about one pound of lactic acid and one pound of common salt in sufficient water at a temperature of 75 degrees Fahr. Add the acid to the bath in two portions and paddle the hides for one hour, then work them out on the grain and drench them an hour longer and they will then, after draining, be ready for tanning.

THREE PROCESSES OF TANNING WILL BE DESCRIBED.

If the sides are split out of the lime and drenched they may be run in a solution of sulphate of alumina and salt and then tanned with the one-bath liquor. For each hundred pounds of grains use three pounds of sulphate of alumina, five pounds of common salt and four pounds of Glauber's salt dissolved in eight gallons of warm water. Drum the sides in this liquor one hour; then add the chrome liquor in portions of one gallon at a time at intervals of thirty minutes until three gallons have been used for each hundred pounds of grains in the drum. Drum the sides at least three hours and then let them lie in the liquor over night or longer; then wash them very thoroughly and they are ready for shaving, staining, fat-liquoring, etc. The thicker the sides are, the longer they should be run in the tanning liquor to accomplish thorough tanning.

If the sides are not to be split until after they are partly tanned, they should be thoroughly bated and drenched, then run in alum and salt, partly dried just enough to split nicely, then split and the grains tanned into chrome leather at once with chrome liquor.

ANOTHER METHOD OF HANDLING THE SIDES

is to split them out of the limes, drench them, then pickle them in a pickling liquor made of water, salt and sulphuric acid and then tanning them in the following process:

For each hundred pounds of grains, drained and ready for tanning, prepare two solutions, one of three pounds of sulphate of alumina dissolved by boiling in five gallons of water, the other of

three pounds of sal soda dissolved by boiling in five gallons of water. Mix the two solutions together by pouring the soda solution slowly and with constant stirring into the alumina solution. Let the combined solution become cool before using it. Throw the pickled sides into the tanning drum with ten pounds of salt and five gallons of water for each hundred pounds of pickled stock. Drum the sides in the salt water for fifteen minutes. Then add the solution prepared as above directed and drum the sides for thirty or forty minutes. Then add to the contents of the drum one gallon of one-bath chrome liquor; run the drum thirty minutes; add another gallon and run the drum thirty minutes; then add another gallon of tan liquor and continue running the leather for two or three hours until it is thoroughly tanned through. A pound and a half of salts of tartar should next be dissolved in a little warm water and poured into the drum and the leather drummed for thirty minutes. The leather should then be left in the liquor over night, then horsed up and allowed to press and drain for twenty-four hours. For the purpose of washing the leather, some borax should be added to the water for the first washing and clear water used for the second washing. Of these different processes of tanning, the first one is the best for shoe leather, while the last one is best for glove leather; the second process can be used for both shoe and glove leather.

STAINING OF THE FLESH.

For black shoe leather the next process after washing is the staining of the flesh. A good material for this purpose is Nigrosine P. Have coloring bath at a temperature of 120 Fahr. For each dozen sides dissolve eight ounces of the nigrosine, add it to the leather in a drum and run it twenty minutes. Then drain off the water, press or strike out the leather, fat-liquor it and then black the grain. Instead of the nigrosine liquor, a hemolin liquor may be used for both flesh staining and grain blacking—five pounds of hemolin and a few ounces of sal soda or of borax being boiled in ten or twelve gallons of water and then increased to fifty gallons by the addition of cold water. A good striker to develop the black on the grain is made of fifteen pounds of copperas and five pounds of blue vitriol to fifty gallons of water.

PREVENTION OF CHROME SORES AMONG TANNERY WORKERS.

By Dr. Louis E. Levi,
Chief Chemist Pfister & Vogel Leather Company, Milwaukee, Wis.

The chemist employed in a tannery is frequently called upon to render aid to the injured before the arrival of physician or surgeon.

In this emergency he is obliged to wash wounds with antiseptics, bandage cuts, to apply weak acids or alkalies to burns caused by alkalies or acids, to stop the flow of blood from a severed artery, and to alleviate the pains originating from various causes. All these different cases have the tendency to instruct the chemist in the use of certain medicaments and appliances of minor surgery. At this point the chemist usually stops and rests upon the laurels won in the successful first-aid treatments.

CHROME SORES.

The tanner of chrome leather, besides having the usual number of daily accidents generally allotted to the manufacturer employing unskilled labor and using high speed and powerful machinery, is also burdened with a disease among his men known as "chrome sores."

These sores, if not attended to properly, tend to eat into the flesh very deep and become very painful to the person so afflicted. I have tried all kinds of alkaline and neutral ointments for the cure of this disease, but without success, although there are quite a number of remedies if the workman, after being cured, will take up some different work. I concluded to abandon the methods of curing and proceeding upon the lines as expressed in the old saying that "An ounce of prevention is worth a pound of cure," I concentrated my work upon the method of prevention of these very irritating and painful sores.

A VERY EFFICACIOUS OINTMENT.

Without going further into details, I will give the formula for making and the method of application of a very efficacious ointment. After a year's trial the frequency of the cases dropped from four to six every week to two cases in six months. This test has proven to me that the ointment will do all that it is claimed if regularly and properly employed once or twice daily. The formula is as follows:

Petrolatum, 3 parts.

Lanoline, 1 part.

Melt on the water bath or stove; when melted and thoroughly mixed, add 10 to 15 drops of 90 per cent pure carbolic acid to every 400 grams or 5 drops to every four ounces of the mixture. Pour into a glass or earthenware jar and allow the mass to solidify, when it is ready for use.

The application is as follows: Let the workman clean his hands and arms thoroughly with soap and water. Rinse with warm water and while still moist apply the ointment. Rub in well, so as to cover all exposed skin, for about two or three minutes. Then take a clean cloth and wipe dry. The skin will be left entirely dry and with no greasy feeling. This ointment can also be used for chapped hands. For those

who work in water, it has shown itself to be an excellent preventive against the effects of the rapid change of temperature from temperate to freezing.

USE OF OINTMENT.

The directions for using the ointment in the cure and prevention of chapped hands are the same as given for chrome sores. Not only for the above mentioned conditions, but also for burns, scalds, etc., can this product be used with excellent results. The theory for the use of the above ointment is: Lanoline is absorbed by the skin and petrolatum forms a light coating on the surface. The application of the two inert substances prevents the action of the chrome upon the surface, and at the same time the absorbent grease prevents the action of the chrome should the outer coating of petrolatum wear off.

Upper Leather and Glazed Kid.

FINISHING RUSSET, FAIR AND COLORED SKIRTING.

An experienced tanner writes:

Take some forty sides, 12 to 18 pound-stock, right from the liquor and have them skived and leveled. Then put them into the sumac vat and leave for two hours, to fill up and color. The vat should measure 5 by 9 feet and should be filled within one foot of the top. Put in one bag of dry sumac. American sumac will do, but Sicily is of high quality and produces better results.

Heat to 120 or 130 degrees. Instead of the slow process of using a vat, the sides could be bleached in a short time in a wheel. Throw three pails of dry sumac into one-half barrel of water, heated to 140 degrees, then put this in the wheel and set it going. A short time will be all that is required.

Whether put in vat or wheel the sides should be taken out in due time, placed over night to drain, or the moisture can be forced out bv pressure, and then the sides are ready for bleaching.

BLEACHING.

The bleaching could be done by wheel or mill, as it is highly important to get a good, light-colored base, which will suffice for either russet or colored stock.

Beside the wheel put a barrel holding 50 gallons, and into this drop eight pails of dry Sicily sumac, and fill the barrel half full of water. Heat for half an hour at 160 degrees, and then add four pounds of muriate of tin, which should first be dissolved in a pail of boiling water. Fill up the barrel with water, and heat the contents to 125 degrees. Throw the 40 sides into the mill and start it going and through the open door throw in a pail at a time from the mixture in the barrel until there is enough to thoroughly soak the leather. Keep the mill going for an hour, then pull the plugs and let liquor run out.

Now put 22 ounces of sulphuric acid, or vitriol, into half a barrel of water and re-bleach the leather in it by throwing this solution into the mill and running for five minutes. This washing will take out all the rust and emery and bark stains and spots. Then rinse the leather

finally by pouring cold water into the wheel and running it for ten minutes. This completes the bleaching. The stock is sent to the dry loft, dried out, and then soaked in cold water and packed down over night to be ready for the swabbers the next morning, who will prepare it for the stuffing wheel.

STUFFING.

I now want to speak of a part of the finishing process which some tanners fail to understand. I have seen many finishers puzzled to know how to stuff skirting and get the necessary weight and color, so as to have a clear base to work on, in case colors are wanted. Shall be glad to give right here the most desirable stuffing to be employed. And possibly some of my readers may get as good results from it as I have in my daily work.

Forty sides of 12 to 18-pound stock averaging 16 pounds to the side, is about the quantity of leathers which stuffers are liable to put into a wheel at one time for skirting. Here are the proportions to be used for this bunch of leather:

40 pounds wax,
3 pounds tallow,
25 pounds cod oil.
Sweat the stock in a steam box and stuff in the usual way.

OILING.

After the leather is thrown on the table and set by hand it should be given a hot coat of sod or neat's foot oil on the grain side. When dry, turn and reset on the table by brushing it on grain side with water 180 degrees warm. Take over to the stoning jack and stone all over, giving particular attention to the rough heads and grainy places. After the stoning is thoroughly done take the leather back and reset on flesh and grain, then hang up for final drying.

READY FOR STAINING.

If my formulas are carefully followed the skirting will come out in fine shape and be ready to be stained in any of the popular shades for skirting.

For russet alone the leather after being dried should be sized on the flesh side with Irish moss solution and rolled damp. When dry size the grain with heavy flax seed water (one pail), to which should be added four ounces of gelatine. Roll damp and either glaze or dry finish it.

HOW TO MAKE BLACK BRIGHT POLISHED GRAIN LEATHER.

The sides should be carefully assorted before splitting and should be free from grain scratches or other imperfections. After the leather is split it should be shaved to obtain an even substance. After shaving mill the leather for one hour in strong sumac at about 100 degrees heat; then rinse in warm water and give the leather a good scouring on both flesh and grain side and hang up to dry. When dry damp down as for mill stuffing (very evenly) and lay in a pile covered over night. Then give to every 100 pounds damp leather 12 pounds pure cod oil, 2 pounds French or Merino degras, mixed in 2 gallons thin soft soap. Heat this mixture to 120 degrees and heat the mill to 125 degrees. Run the stock for twenty minutes to a half hour, and let it cool before setting. Use as little oil on table as possible while setting and put a very light coat on the solid part of the flesh side after it is set. Set very tight on both grain and flesh side; the tighter the leather is set the finer and more even will be the grain after the leather is grained or boarded.

BLACKING.

Special attention should be given to the flanks and soft parts in setting, as the least bit of slackness will cause the grain to turn up coarse and loose and spoil the appearance of the leather when finished. After the stock is dried out it should be blacked as soon as possible, as it takes the black quicker and much easier than if laid in piles for some time. After blacking it should be dried out thoroughly. Use strong logwood liquor or hemoline and ammonia for the set and any kind of grain black customary in the shop will answer this purpose.

SEASONING.

After the drying dampen the grain before pebbling or printing very evenly with a sponge and weak logwood liquor heated a little. As soon as this dries in the grain give the first coat of seasoning. Any of the levant finishes produce good results when used according to directions, or the following can be used, which produces a very bright deep black finish: Dissolve in three gallons soft water ¼ pound extract logwood, ¼ pound gelatine (isinglass). When cold add 2 ounces ammonia, 1 gallon beef blood, 1 pint new milk, 2 ounces muriate of iron, 2 ounces spirits of camphor. Mix 1 ounce glycerine in milk before putting into the finish; then mix all together, putting in the iron and camphor after the other articles have been well worked together. Stir thoroughly after all has been added.

GRAINING.

Put first coat on with sponge after leather is damped for printing; then hang up and dry out thoroughly. Then polish with the jack. After polishing damp down. Before boarding let lie in pile for a while to allow the dampness to penetrate evenly; then grain two ways from tail to foreshank and from hind shank to top of shoulder, and soft board one way on the flesh side, which should be crosswise. Let leather dry out, and then finish graining by boarding on grain side crosswise and lengthwise, and soft board on flesh side lengthwise. Then give the stock two coats of seasoning—very light coats—spread even with one sponge and rubbed in with another sponge; the first must be dried in before the second is applied. After the last coat is well dried in the stock is ready for the last polishing with a jack or polish wheel. Sufficient pressure should be used to cause the grain to disappear and bring the brightness from the bottom of the impression of the print. After the polishing the stock should be staked by machine on the flesh side or slicked on the flesh side with the slicker wheel.

Then give last graining. Grain four ways on the grain side very light and the result will be a very fine even grain, bright and deep black. Now oil the stock evenly on the grain with hot oil; a mixture of equal parts of raw linseed, paraffin and sweet oil makes a good oil for this work.

After oiling the stock should be left in a pile for a few days before assorting or rolling up. If these instructions are carefully carried out the results will be first-class in every way.

BRIGHT BLACK FINISH FOR SATIN AND GLOVE LEATHER.

In 15 gallons of water cook 5 pounds of borax until dissolved. Then add 30 pounds of orange shellac ("Diamond C"), and cook two hours. If shellac is not well cooked it will "streak" the finish.

In a separate barrel cook 30 pounds of chipped logwood one hour in 40 gallons of water. Add logwood solution to shellac solution when both are at boiling point, but do not cook.

Dissolve 4 ounces of bichromate of potash in one-half gallon of water; cook and then add to the above. In this should be added from 1 to 2 ounces of yellow aniline dissolved in one quart of water.

Let the solution become cold and then dissolve 6 pounds of blood albumen in 6 gallons of water over night. Next morning add 6 gallons of lukewarm water to the albumen solution and mix. Then add 6 gallons of beef blood. Stir, and add 2 ounces of carbolic acid. Then dissolve from 1 to 1½ pounds of nigrosine. Add this in quantity to produce the black desired.

The logwood and shellac must be perfectly cold before the blood and

the albumen are added. This finish should be barreled up ready for use. The recipe given will produce about 60 gallons, but a gallon more or less will not make any particular difference. If a brighter finish is desired use more shellac. Ammonia should be used to suit the stock. The finish should be stirred up and strained before using.

PLAIN SATIN LEATHER.

To get out satin leather take your hidehouse, beam house, yard and currying shop labor, and the materials used, and on 13 to 15 foot leather it will not cost over 48c per side. Figure on an average of 14 foot, it will cost less than 3½c per foot for all labor and materials used. This is on the basis that labor will not exceed 3c in the beam house, and in the shop. The most expensive part is hand buffing and finishing. In the materials used bark figures 8c and grease not over 7c. In the labor, of course, you can't throw away anything to get it out at this price, and the superintendent should always figure where he can save. Use a belt skiver and splitter and machine shaving, and you will get good results, and your belt knife skivings will more than pay for your labor in splitting. Now to put this stock in a bright finish or glaze, it would not cost any more per foot than the plain, as the materials used do not cost any more and offset the extra labor you have had in boarding and glazing. Only use about two-thirds of the amount of grease, and a softer grease, of course, in order to get softness and a high finish.

A great many claim they do not get good results with a belt knife splitter. The trouble lays in the foundation of the machine. You must have a good, solid foundation for your machine, so it will not jar or shake.

FINISHING WAX SPLITS.

Take 100 pounds of dry splits and damp them by wetting one split and placing a dry split on top until a pile of 500 splits are piled up, with wet and dry one alternating. In other words, put 250 splits in a tub and mix them with 250 dry splits. A wet split should be laid down first, then a dry one; backs one way and evenly matched. Let them lay in a pile covered with sacks for three days. Three hundred pounds of splits should take an additional weight of 35 pounds when damped carefully. This is about the ratio of increased weight to each hundred pounds of splits.

Now give 50 pounds of grease, which should be made as follows: Cook hard glucose in a kettle by itself to 140 degrees Fahrenheit. In another separate kettle place one-half degras, one-half brown grease and one-third best quality of stearine and cook to 150 degrees Fahrenheit. Mix the glucose with grease when you are ready for stuffing.

Use from 10 to 15 pounds of glucose with 40 pounds of combination grease. Use judgment as to giving more or less glucose according to the weight you wish to put into the leather. The glucose will give a nice light colored back and also gives weight. Glucose is all right, but you should be careful not to make splits too heavy with it, and thus hurt sale of them.

When working glucose into leather judgment must be used. If the leather is too wet or too dry, or of hard tannage, no stearine is necessary. Under such conditions good brown grease and degras and glucose will be enough. Glucose must always be used according to weight.

COMBINATION BOX CALF FROM SIDES.

Sides selected for what is known as combination box tannage, says a practical man, should be made from hides of good quality, free from barbed wire scratches, and should not measure over 15 to 17 square feet per side. I find hides that have an area of 12 to 15 quare feet are much finer in texture than those exceeding this limit.

After the leather is split and shaved, re-tan if necessary in a weak gambier liquor, say 13 to 15 degrees of strength.

If the stock is green in spots it is well to lay in piles for three days so as to be sure all the raw spots are tanned. Use the drum if necessary.

AFTER TANNING.

When the leather is tanned, give it some sumac in the drum at a temperature of 95 to 105 degrees Fahrenheit. Run drum one-half hour, withdraw leather and leave it in pile for two days.

The sides are now ready to color into blue black. For a drum full, take 100 sides, which is a fair quantity for one drum. Dissolve 2 pounds good nigrosine; 10 to 14 ounces hematine (logwood); 6 to 8 ounces violet dye, 3B; 2 ounces bichromate of potash; 1 pound hyposulphite of soda. Put into 10 gallons of water and cook until dissolved, adding enough cold water to make 20 gallons altogether.

Put this mixture in a drum and run the hundred sides in it for 20 minutes. Use more violet if you wish for a nice deep purple black.

SCOURING.

The sides are next scoured on flesh side and given a coat of good oil on the grain side. Hang up to dry, then take down and damp with hot water. Follow this by a fat-liquoring in half cod oil and half moellen degras; use some sal soda to cut this greasy mixture.

If perfect the sides can be set after being treated with hot water

by first giving the table a liberal coat of oil, then place the side on a table and go over it first with a stone. Be sure your stone is smooth, so as to avoid chipping the grain; then use a brass slicker.

Apply a coat of oil to grain before handling the sides. Good judgment must be used, as no two tannages take exactly the same amount of grease. If the leather has too much grease it is impossible to obtain a nice rich luster when glazed by machine.

SKINS SHOULD BE CAREFULLY EXAMINED.

When the sides are dry the buffer should carefully examine them and remove all imperfections he sees. He should be careful not to buff off too much. As much grain as possible should be left on the side and it pays well to intrust this important work to men who are well paid and responsible. The buffer must know from long experience whether certain little marks will show or not when finished. After the imperfections are spotted and then buffed, here is a first-class recipe for covering or healing the buffed spots: Dissolve 1 pound of gum tragecanth in a gallon of water, which already contains 2 ounces of nigrosine. Reduce this to a heavy cream and apply it to the buffed spots.

RE-BLACKING.

Now follow by re-blacking on tables, using a solution containing one-half nigrosine, one-half logwood extract mixed together and put into 3½ gallons of water. This nigrosine and logwood extract should not be used too freely, but rather that this mixture should weigh from 3 to 4 ounces, which would keep the solution from being too heavy.

After this mixture has been applied once to the sides they are now ready to be printed with a box roll. There is only one roll used to get the box figure by graining. After being printed, the sides are grained three ways against the print. Hang up to dry, then take down and apply a coat of finish and soft board on flesh side two ways. Still better, I would recommend emery wheel for the flesh side. Now give another coat of finish, this time using the blacking machine for putting it on. If you have no machine a brush is the next best thing, and is far better than a sponge for applying finish.

FINISHING.

The following finish is cheap and good: Dissolve one-half pound methylated violet, 6B, in five gallons of water and cook until dissolved. After cooling add three gallons ammonia and 25 gallons beef blood. To this mixture pour in carefully a cold solution including 1 pound bichromate of potash dissolved in 5 gallons of water. Add 5 pounds of

extract of logwood, which have been dissolved in 12 gallons of water, but do not mix in until this solution is cold. Add some carbolic acid as a preserver, strain and then this mixture is ready for use.

When the leather is dried out from this last finish, glaze by jack and grain one way against the print. Scrape flesh on stakers, then grain up straight, oil off and your leather is then finished.

If the box grain is loose or pipey it is well to roll lightly on flesh side before the last oiling is applied.

SUGGESTIONS ABOUT MAKING GLAZED KID.

In the manufacture of glazed kid the coarse grain must be kept from rising, so that when the goods are finished the grain is flat and smooth. Softness, strength and durability must also be in the combination.

BEAMHOUSE WORK THE FOUNDATION.

The beamhouse work is the foundation, for here good or poor leather is made. In soaking the dry skins chemicals are being used in the water to bring them back to their natural condition, free from dirt and blood. After being partially soaked the skins are well broken by milling in the fulling mill, instead of by hand over the beam. The mill breaks up the glace on the flesh, softens the fiber and on returning the skins to the soaks the after-soaking is rapid and uniform.

LIMING.

In liming goatskins a weak mellow arsenic lime is used on the start to prevent rough grain and the skins from plumping too much. The following day the skins are shifted over into stronger arsenic limes and finally into white limes.

Proper liming gives the skins softness and elacticity with a grain which will work down after puering.

After being unhaired and fleshed, the skins go into the puer for killing of the lime and for a soft, silky grain. Here is an important point, for on the puering much depends. Goatskins, being of a close, tight texture of grain, need a bacterial bate to reduce the skins so that they will give readily in the working out. This working out, or slating, as it is sometimes called, is very important. It not only removes the scud and short hairs, but cuts down the coarse grain. Morocco finishers realize the importance of putting out in good shape a tanned skin which is of coarse grain to have it finish fine. Here the drenched skin is soft and silky, and readily gives under the workmen's stone.

PICKLED INDIA GOATSKIN.

The pickled or processed India goatskin is receiving considerable attention from tanners of glazed kid. Many manufacturers who have succeeded in tanning pickled sheepskins by the chrome process are now trying to make soft-feeding stock from the pickled India.

The grain of the pickled India is so coarse and prominent that it shows up badly when finished. The skins also lack the velvety feel that goatskins are made to possess when soaked and limed on this side of the water. Manufacturers know that especially in the case of goatskins the beamhouse work is everything to the softness and fineness of the finished article, and that before these skins are given any tanning material they must be in condition to receive it.

The pickled India being full of acid and salt, or of some material which answers as a preservative, is of course in a cured state, and before it can be got into condition to work out the coarse grain a drenching must be resorted to. A drench composed of salt whiting and a little borax or sal soda should be used for the purpose. In a short time the skins will rise to the surface. If they then show any acid, stir them for a short time and then wash free of whiting. It will be found that the borax not only helps to kill the acid, but prevents an excess swelling of the skin.

Many think that by using whiting on pickled skins the skin is made tender. This is the case only when the drenching is overdone or the whiting not thoroughly washed out. If after this treatment the skins need to be made softer before slating, they should be placed in a manure bate until the required softness is reached. Since these skins have been cured, and by the curing process the grain made rigid, they must be thoroughly softened, else the slate will friz the grain wherever there is a rough spot.

TWO-BATH CHROME TANNAGE BEST RESULTS.

For a tannage on this class of stock the two-bath chrome tannage is believed to give the best results. As the skin in this class of stock is very tight it needs considerable splitting up of the fiber. In potash solution enough salt should be used to control the acid and keep the skin open.

As a rule very few mistakes are made in the first bath. In some instances a mistake is made by hurrying the chromed skins into the reduction bath as soon as the chrome acid shows through the thickest portion. The skins should be horsed up smoothly for at least 24 hours to allow the chromic acid to set in the fiber of the skins.

In the second or hypo bath one's troubles commence if the skins are allowed to bleed. This bleeding may be prevented by dipping the crome skins in the "hypo" bath and horsing up for a few hours and then finishing the reduction in the paddle wheel in the usual man-

ner. The reduction should not be rapid and care must be taken that the skins are not over-reduced.

FORMULA FOR MAKING GRAIN LEATHER FROM SPLITS.

The splits should be run through a borax bath in a drum. Five pounds of borax dissolved will be enough for 25 splits, medium size and weight. Have water heated 75 degrees Fahrenheit, 6 gallons, and run 25 minutes. Then make a bath of sulphuric acid, say about 6 to 8 gallons, have it as sour as a lemon. Run 15 minutes, then rinse off in clear, cold water. Run in plenty of clear, cold water until the acid is all soaked out of the stock, then fat-liquor:

Five pounds chip soap, 2½ pounds neatsfoot oil. Boil the soap in 3 gallons of water and add the oil, with an ounce of sal soda.

Cool to 80 degrees Fahrenheit and run 30 minutes. Then horse up to drain. After which slick hard on both sides and glass on split side. Oil with linseed oil; then hang up, or tack out to dry.

When they are dry they will be ready to receive the color; either black or brown, or in fact any color that is wanted. After they are colored and dry they are ready for the moss or linseed solution. A good dressing is made from glue and gelatine half and half. Apply when warm, but be sure and not have it too thick. Care should be taken to spread it on even. After the dressing is allowed to dry. Then they must be embossed either in imitation of some grain or plain. This is a very necessary operation, and the machine used for the purpose is from four to six feet in width. After embossing, the embossed side is given a coat of water-proof filling which is made of wax and rosin dissolved in turpentine. As all curriers do not have suitable embossing machines I will be glad to inform them where they can have their work done.

SOME SUGGESTIONS ON SPLITTING LEATHER.

There are right and wrong ways of splitting leather. It seems to me that it would be of considerable help if young splitters could attend some place to get the benefit of men of experience and not have to learn pretty near everything by themselves. Here are some suggestions which may possibly be found of benefit to those who, like myself, believe that there is something to learn all the time.

If splitters on the belt knife machine would look more to the bevel on their knife before starting to split leather, it would save time, trouble and vexation.

When you place a new knife on the machine be careful and fit the grinder jaws well forward, no matter if the grinders do grind into

the jaws. By so doing you can control the edge by having it cocked up or down. Commence to grind on the under grinder. Do not grind on the inside until you have a good bevel, then grind on the inside last. By so doing you will have your edge cocked down. If you wish it more so, grind harder on the under grinder. That will give you what we call a cocked-down edge which is best on light stock.

TANNING AND FINISHING GOATSKINS.

All first-quality goatskins for shoes are tanned with the chrome tannage, both by the one bath and the two-bath processes. The following method is so simple that a boy could do it, and make first-class leather. Wash the skins in a weak lactic acid bath after they have been reduced and cleanse from the bate. Next for a few minutes in a warm borax water bath, which is made by adding 6 pounds of borax dissolved in hot water, to 800 gallons of water. If the skins are very dirty wash until they are clean. Next let them drain over night and in the morning weigh carefully.

PLUMPING.

A solution of salt and hydrochloric acid is the next step. This operation will plump up the skins and keep them open while the tanning process is going on. It also keeps them in good condition to strike out readily after tanning. Make a process of say 12 pounds of salt for each 120 pounds of skins (that have been on a horse over night) with 20 gallons of soft water. Put the skins in a drum and run them about 20 minutes, after which (the acid is put in while the drum is in motion) for every 120 pounds of skins in the mill, 2¼ pounds of muriatic acid is mixed with 2 gallons of boiling water. Cold water for cooling is added, then the mixture is poured into the drum and the skins are drummed in the salt and acid about 20 minutes.

READY FOR CHROME PROCESS.

The skins are now ready for the chrome process which consists of 2¼ pounds of bichromate of potash for every 20 gallons of water which is applied to the skins at a temperature of 65 degrees Fahrenheit. After milling the skins for about 25 minutes in this solution more potash and salt should be added, say about 4¼ pounds bichromate and 2¾ pounds of salt. Feed this to the skins without stopping the drum and mill them until the thickest part of the skins show that the yellow liquor has struck through. After you are satisfied about this, remove from mill, horse up and drain over night in a dark place, or cover with heavy paper, slick off in the morning.

One bath: After drenching and washing, if the hydrochloric acid

and salt is not used, the washed and drenched skins are drummed in a solution of 12 pounds of salt in 6 gallons of water for every 125 pounds of skins, for 25 minutes. The chrome liquor is milled into the skins 1 gallon at a time, until 4 gallons are used and the skins are tanned through. It takes about 4 hours and the skins may be left in the liquor 20 to 30 hours, so that the salt will have time to act. Then a washing in warm borax water, for 20 minutes, and they are done.

HINTS ABOUT SPLITS.

There has been much thought given and many experiments tried by tanners regarding the best method of tanning out splits taken from hides that have been split in the lime, the grain being used for chrome purposes. In some cases the splitting is done from the limes after unhairing, and the grains are then bated and treated with a pickle of salt and acid with alum sometimes added, after which they go into the chrome. Other tanners after unhairing, get the lime out and sides bated, and pickle before splitting. The grains are then ready to go into the chrome on leaving the splitting machine. Of those using the latter way some have adopted the methods used by makers of goat and sheep leather, which works very well on this light class of goods. That is by milling the stock in a solution of salt, bran and whiting, for one hour in a drum or pinwheel, which effectually kills the acid or alum and salts, and then rinsing in clear water to get the whiting out. This is all right when sumac is used in the subsequent tanning, but is quite contrary to what should be given leather which is to be stuffed heavily and made as firm as possible.

RETANNING.

The claim is that if the salt and acid or alum are not thoroughly washed out of the split before entering it into a vegetable tan, the leather will be open, spongy and of poor fiber. However, such has not been the experience of tanners who have tanned out splits made by the combination process, in which salt and alum are freely used. The grains from this combination process are sold by the foot and are not required to carry grease. They are only placed for a few days in bark or extract liquor before being split, and the splits are practically raw. To get them into proper condition to carry the stuffing they must be retanned in bark or extract liquor, which will result in fine, firm and well-filled leather.

The surest and best way to retan splits, taken from sides that have been treated with salt and acid or alum, is to first mill them in a drum or pinwheel in which is a weak solution of gambier until they are thoroughly softened. Then handled out every day in good sweet

extract or bark liquor until they are tanned and filled. If treated in this way all traces of salt, acid or alum will have disappeared in the bark liquors, and none will be left in the splits to spew out after finishing.

Don't make the mistake of milling these splits in water before putting them into the bark liquors. If you do they will go flat—and no subsequent treatment will bring them back their lost plumpness, and only poor, flabby leather will result.

HELPS IN MAKING GLAZED KID.

The action of lime on the grain of hides and skins has a tendency to make it rough and harsh, and stock intended to be finished on the grain should never be unhaired immediately after coming from the limes. The skins on coming from the limes should be allowed to lie in the water pits over night to allow the depilatant to wash out, and also to soften the grain which has been roughened by the depilatants. This to a great extent lessens the danger of nicking and scratching the grain, which means much to the manufacturers of fine goatskin leather. Moreover, allowing the skins to remain in the water for a sufficient lenth of time after coming from the limes enables the workmen to work on them some time before putting on gloves. The longer he can work without gloves the more he can accomplish in a given time, although the gloves are an absolute necessity after a time.

PUERING.

After the unhairing and fleshing, which in all large factories are now done by machinery, the skins are ready for puering. The excrement of the dog, pigeon or hen may be used for this purpose. That of the dog is perhaps the best, but it is expensive and difficult to obtain in sufficient quantity. If excrement of hen or pigeon is used it should be gathered while fresh and dried for future use.

The best way to prepare the excrement for puering is to put a sufficient quantity in a bag, place the bag in a barrel of water, run a steam pipe into the barrel and raise the temperature to the boiling point. Cover the barrel to retain heat. The use of bags keeps gravel and other filth out of the bate, and the danger of scratching and discoloring the grain of the skin is lessened.

After the excrement is well steeped pour the liquor into the drench, throw the skins in and start the wheels. The next day the skins are taken out and are ready for stoning or slating, which is either done by hand over the beam or by a machine. Slating works the grain down so that it is soft and silky and removes all short hair and scud.

THE BRAN DRENCH.

After slating the skins are run in a bath made of lactic acid and water or put in the bran drench to further the lime killing and softening. The bran drench is prepared by putting the required amount of bran in the pit and running in sufficient water to make the mixture of a soup consistency. This is then cooked by means of the steam pipe. After cooking more cold water is added. There should be enough of this mixture to allow the skins to move about freely. As the drench sours gases are formed and the skins rise to the top. It will be necessary to stir them down a number of times or they will not be drenched evenly. Drenching usually takes about 12 to 20 hours if the drench works well.

WATCH CAREFULLY IN HOT WEATHER.

In hot weather the skins need to be carefully watched, for butyric fermentation is liable to take place, in which case the skin is destroyed in a short time. Butyric acid is a powerful solvent of gelatine. The bran drench should be newly made every day.

After being taken from the drench they are washed in warm water and are then ready for tanning. As goatskins are tanned either in the combination or mineral tannage it is quite essential that all lime be worked out or they will not give or stretch in working. The result will be tight texture skins.

Goatskins are naturally of a hard, tight texture of grain and will stand a lower drenching than most any other kind of stock. To insure a fine piece of finished leather the skins must be well worked in the beamhouse.

MANUFACTURE OF GOAT AND KANGAROO LEATHER.

The processes of tanning described in this article may be used with equally good results in the tannage of both kangaroo and goatskins. Satisfactory leather has been made by them; and the skins after tanning may be colored any desired shade or blacked and finished up in either glazed or dull finish.

THE BEAMHOUSE TREATMENT

is the same as for any other chrome process. Goatskins, after being limed, should be bated in a manure bate, and then drenched in a weak lactic acid drench, made up of warm water, salt and acid. For every 100 pounds of skins about one-half of a pound of lactic acid and an equal quantity of salt should be used. The water should be at 90 de-

grees, and the skins should be paddled in the drench about 20 minutes, then rinsed in warm water and are then ready to be either tanned or pickled according to the process of tanning.

DO NOT REQUIRE MANURE BATE.

Kangaroo skins do not require a manure bate as they are nicely prepared for tanning by the use of either lactic acid or a bran drench. After washing from the limes, the unhaired skins may be drenched in a bath prepared as follows: To the required volume of water in a paddle vat at 90 degrees, add 1 pound of lactic acid and 1 pound of salt for every 100 pounds of skins. The skins should be drenched about 45 minutes and then removed from the drench, worked out upon the grain and put back in a drench one-half as strong as the first one for 20 minutes, rinsed off, tanned or pickled.

DELIMED.

Both kinds of skins can be delimed very satisfactorily in a sour bran drench prepared as follows: Bran is mixed with water into a thick mush and allowed to stand until it is sour. About 1 barrel of bran is required for 1,000 small or 900 large skins. When the bran has been added to the warm water in the paddle vat about 3 quarts of sulphuric acid and a bushel and a half of common salt should be added and thoroughly stirred and the skins put therein. After about 5 hours' treatment the skins should be taken from the drench and slated and then washed in warm water which will make them sufficiently clean to be either pickled or tanned.

WHEN SKINS ARE TANNED

without being pickled they are taken after the last washing and placed in a pin mill drum with a solution of 3 pounds of sulphate of alumina and 6 pounds of salt and 6 gallons of water and are drummed in the same 45 minutes. They are then given the concentrated chrome liquor, one gallon at a time every half-hour until 3 gallons for each 100 pounds of skins have been used and the drumming is continued until the skins are tanned through, which usually consumes at least 3 hours. The skins can also be tanned by being placed, after the drumming in ilumina and salt, in a chrome bath in a vat. This should consist of 3 gallons of chrome liquor for each 100 gallons of water in the vat and as the tanning proceeds more chrome liquor should be added until 6 or 7 gallons have been used for each 100 gallons of water. When the skins are tanned in a paddle-vat they should be entered into the liquor in the morning and paddled constantly during the day and then, if possible, stirred several times during the night, in order to keep the skins from becoming wrinkled.

TO PREPARE THE DRENCHED SKINS.

For the following processes of tanning pickle them in a process liquor made of water, sulphuric acid and salt. Enough salt is added to water to make a strong brine and then acid is added until the liquor has a sharp, sour taste. The skins are left in this liquor for several hours, removed, drained and are then ready for tanning.

The drained pickled skins are weighed. For each 100 pounds of skins prepare a solution by boiling until dissolved 3 pounds of sulphate of alumina in 5 gallons of water. In another tub dissolve by boiling 3 pounds of sal soda in 5 gallons of water. Then add the soda solution slowly and with constant stirring to the alumina solution and set the resulting liquor aside until it has become cool. It is good practice to make this solution the day before it is used. The pickled skins are first run in a drum in a strong brine made of 10 pounds of salt and 5 gallons of water for each 100 pounds of skins and in this salt solution the skins are milled 5 minutes. Then add the cold liquor described above and drum the skins one half-hour. For each 100 pounds of skins in the drum 3 gallons of concentrated chrome liquor are required. One gallon is added to the contents of the drum at a time at intervals of one-half hour until the 3 gallons have been used and the skins are drummed in the combined liquors for at least 2½ hours, or until they show penetration of the tanning liquor. One pound of salts of tartar is next dissolved and added to the liquor in the drum and after 30 minutes' drumming the tanning will be complete.

ANOTHER PROCESS.

Another process of tanning the pickled skins is carried out as follows: To each 100 pounds of drained pickled skins dissolve in 8 gallons of warm water 1 pound of Glauber's Salt. Drum the skins in this solution for 10 minutes. The skins should then be thrown back on the sides of the drum, the plug pulled out and the Glauber Salt liquor is drained off. The plug is then replaced, and for each 100 pounds of skins 8 pounds of salt and 8 gallons of water are thrown into the drum, and the skins are drummed therein for 5 minutes. Three gallons of one-bath chrome liquor are required for each 100 pounds of skins, added 1 gallon at a time, every half hour, until all is in, and the skins are then drummed until they are tanned. One pound of bicarbonate of soda is dissolved in warm water and added to the contents of the drum, and a further drumming for 30 minutes completes the process. The tanned skins should be left in the liquor over night, then drained and washed first in borax water and then in clear water until all traces of tanning materials are removed.

CHROME LIQUOR.

If a tanner desires to make his own chrome liquor he may use the following with good results. One hundred pounds of chrome alum dissolved in 140 gallons of lukewarm water. To this is added a solution of sal soda—28 pounds dissolved in 30 gallons of water. Of this liquor from 3 to 6 gallons are required for each 100 pounds of skins, according to their thickness. A good chrome liquor is also made of the following ingredients: Three pounds of bichromate of potash are dissolved in hot water. To this solution is added half a gallon of hydrochloric acid, and then glucose, a little at a time, until the yellow liquor changes to a deep blue green. About 1½ pounds of glucose are generally required. The solution is made up with water to two gallons. A large quantity of this liquor can be made by keeping up the right proportions, and increasing the quantities used. No matter what process of tanning is used the skins require a very thorough washing before they are colored and fat-liquored. Then they are shaved, and if black leather is wanted they are stained blue or purple upon the flesh, fat-liquored and then blacked upon the grain. A good staining liquor is made of hemolin and borax. Blue nigrosine may also be used, a few ounces being sufficient to stain a dozen skins. A good blue flesh is also obtained by the application of a liquor made of blue aniline, methyl violet, acetic acid and bichromate of potash. The ingredients are boiled in 8 gallons of water and then enough water is added to make about 20 gallons of stain. The ingredients are used in the following quantities: Twelve ounces blue aniline, 6 ounces methyl violet, 1 pint acid and 1 ounce potash.

FAT-LIQUORING.

Before the leather is fat-liquored it should be well washed after staining and then either struck out or pressed.

FOR DULL FINISHED LEATHER.

A fat-liquor made of soap and sod oil produces good results. Twenty pounds of fat-liquor soap, 40 pounds of English sod oil and 50 gallons of water are the proportions.

For glazed finish an emulsion of soap, oil and degras is recommended. Boil 10 pounds of soap in about 10 gallons of water. Then cut 4 gallons of neatsfoot oil by pouring into it and stirring a few ounces of dissolved borax or potash, and mix the oil with the boiled soap. Then add 6 pounds of degras, stir the mixture thoroughly, and then add enough water to make 50 gallons of fat-liquor. From 2 to 6 gallons of this emulsion are required by each dozen skins, according to their size and thickness. For light skins the degras can be omitted

and egg yolk used instead. Fine, light skins are also nicely fat-liquored by the use of an emulsion of egg-yolk and olive oil.

All surplus water should be pressed out of the leather before the skins are fat-liquored. The fat-liquor should be used at a temperature ranging from 90 to 120 degrees. After the fat-liquor has been applied the leather should be drummed therein for 30 minutes and then laid in piles or thrown smoothly over horses for 24 hours, then grain blacked, oiled and dried out.

AN EXCELLENT BLACK

is made of 5 pounds of hemolin and 3 pounds of sal soda in 50 gallons of water. This liquor makes a good flesh stain also. For the set use 5 pounds of copperas and 2½ pounds of bluestone for 50 gallons. The blacking of the grain may be done before as well as after fat-liquoring. After the skins have been blacked they should be rinsed off, struck out, and given a light coat of glycerine and water, then set out again and oiled upon the grain.

IF A GLAZED FINISH

is to be finally put on the oiling should be very light and either neatsfoot or a good mineral oil used. It should be used warm and put on evenly. For soft dull leather a heavier coat of oil should be put on in order to make the grain soft and silky. The skins are then dried out.

After staking, the leather is ready for the final finishing. It is a help in getting a clear and bright finish to give the grain an application of lactic acid and water rubbed into the grain and dried out. A slight washing of the grain with a sponge before seasoning is also a benefit. The seasoning or glazing fluid should be put on lightly and well rubbed into the grain and after drying the leather is glazed. Two or three coats of seasoning are usually required to get the desired finish.

IF COLORED LEATHER

is wanted the skins, after being washed from the tan and shaved, require a treatment with vegetable extract to prepare them for the dye. For each dozen average skins use 2 pounds of dry powdered sumac in water at 110 degrees. Drum the skins in this for 20 minutes, then add 2 ounces per dozen Tartar Emetic and run 20 minutes longer. Then rinse the skins in clean warm water and prepare the color bath at 125 degrees.

Five ounces of the liquid extract of fustic used for each dozen skins also produce good results as a mordant. The skins are run in the fustic liquor for 15 minutes, then colored, and the color is then set with a few ounces of bichromate of potash.

Palmetto extract is another good article to use to prepare chrome-tanned skins for an aniline dye. About 1 pint is required for 100 pounds of skins in warm water, and after drumming the leather for 20 minutes Tartar Emetic is added, the skins drummed 10 minutes longer, rinsed off and colored.

FAT-LIQUOR RECIPES.

Put 10 pounds of Palermo fig soap into a barrel with 10 or 12 gallons of water. Turn on steam and boil the soap until it is dissolved. Stir the soap while it is boiling. Then take 4 gallons of neatsfoot oil. Dissolve in a little hot water a few ounces of potash or sal soda. Then stir the potash or soda into the oil and mix the oil so prepared into the soap in the barrel. Stir the oil and soap thoroughly together. Then add ten pounds of degras to the oil and soap mixture and then fill the barrel with cold water. This makes a very good fat-liquor for almost any kind of skin. It is applied to chrome tanned leather at a temperature ranging from 95 to 120 degrees and to vegetable tanned skins at a temperature a few degrees cooler.

A good fat-liquor is also made according to the above formula with the exception that 10 pounds of egg yolk are used instead of the degras. For calfskins the degras produces the best results. Very light skins, for instance sheepskins, can be fat-liquored with the mixture of soap and oil, degras or egg yolk being omitted entirely.

FOR LIGHT GLOVE LEATHER.

For light glove leather a good fat-liquor is made of 40 pounds English sod oil and 20 pounds of Palermo fig soap, made into a fat-liquor with enough water to make 50 gallons of fat-liquor. There are a great many formulas for fat-liquor that a tanner could use. It would be easier to give the exact information asked for if the inquirer had been a little more explicit in regard to the kind of leather he is making.

The above formulas will produce good results upon goat, sheep and calf skins for either glove or shoe purposes; the amount of fat-liquor to be given a batch of leather depends upon whether the leather is for shoe or glove purposes, and varies accordingly. Glove leather is usually given more grease than shoe leather, as it is usually wanted very soft.

TO WEIGHT SPLITS FOR INSOLING.

After the splits are well filled in the yard, wash off the spare tan, then take a 50-gallon barrel and put in 10 gallons of water, 100 pounds

grape sugar and 100 pounds splate. Cook well by steam until you have a total of 50 gallons.

For a mill of 50 splits take 4 or 5 pails of this solution and mill 20 minutes or so (splits to average 6 pounds). Have another 50-gallon barrel and make up as follows: Four gallons paraffine oil, 1 pint sulphuric acid or 1 pound oxalic acid. Sufficient water should be added to make 50 gallons, then boil with steam.

After running the splits for 20 minutes in first solution, give them a pail of the second solution. If the stuff shows on the outside, apply two pails of 12 degree gambier. You can use more splate if you wish. When ingredients are well into the splits, it is well to scour a little so that they hold the color. You can make them as heavy as you wish with those ingredients.

Hang to sammy. Set on machine, on both sides, then give both sides a solution of Irish moss and a small amount of soap and starch so as to hold the color.

There is a recipe in "Modern American Tanning," Vol. 1, which will answer the finishing process. Of course if you want your splits white you will have to put them through a weak solution of borax and sulphuric acid and rinse. This must be done before weighing. If you need splits extra heavy, give them a solution of grape sugar in drum after being sammied. The solution should be reduced with water and a trifle of cod oil.

MAT FINISHED CALFSKINS AND SIDES.

After calfskins and sides have been carried through the beamhouse properly and have been tanned, it is a comparatively simple thing to finish them into dull finished leather. But there are several points that must be observed if the finished leather is to be satisfactory. Dull finished is preferred, being considerably softer than glazed or boarded leather, and this softness is obtained by the fat-liquoring and oiling. A soft, dry feel is generally preferred to an oil or greasy finish.

ONE-BATH CHROME PROCESS BEST FOR MAT CALF.

The one-bath chrome process is, all things considered, the best for mat calf, as it is easier to use and gives a larger measurement than the two-bath process. Considerable salt should be used to prevent the astringent tan liquor from drawing the grain, and to make the leather full and plump. A good way to prepare the skins is to drum them in a good brine, made of 8 pounds of salt and 10 gallons of water for each 100 pounds of skins, and then giving the sulphate of alumina and soda or the chrome liquor according to which process is being used. The skins should always be milled in the tanning liquor until they are thoroughly tanned. Do not hurry them; give them plenty of time. If

the liquor gets hot in the drum it does no harm to the leather. After the tanning is completed the skins should not be washed at once, but should be horsed up for a day and even longer before they are washed. The washing is done with hot water in a drum or "twister" much more thoroughly than with cold water in a reel. The leather is then struck out and shaved.

TO TAN SIDES FOR CHROME LEATHER.

A good way to tan sides for chrome leather is to drum them in 4 pounds sulphate of alumina and 10 pounds of salt for each 100 pounds of hides bated and washed but not pickled. After the sides have been drummed in this liquor for 40 minutes they should be pressed and split. The grains taken and tanned in the one-bath process work out into nice leather.

In the writer's judgment it is best to stain the flesh, then fat-liquor and black the grain afterwards, instead of doing as some tanners do, black the grain first and fat-liquor afterwards. The color is deeper and the final finish is better when the fat-liquoring is done first.

FAT-LIQUORING.

An excellent fat-liquor for chrome calf and sides is made by boiling 4 pounds of soda ash in 10 gallons of water, then adding 20 pounds of Palermo fig soap, and boiling again for 15 minutes. Then add cold water to reduce the temperature to 150 degrees; then add 100 pounds of French moellon degras, stirring the soap and degras thoroughly together but not boiling them; finally adding enough water to make 50 gallons of fat-liquor. Two gallons of this fat-liquor diluted or mixed with 6 gallons of hot water is enough for 100 pounds of shaved leather. The temperature of both drum and liquor should be 130 degrees. After being fat-liquored the leather should be placed in hot water for a few minutes, then drained and finished.

TO OIL THE GRAIN.

Use either neatsfoot oil alone or a combination of equal parts of neatsfoot and paraffine oils, applied evenly over the grain. Practical experience has shown that it is better to hang the leather up to dry than to tack it after oiling. When the leather is hung up and dried somewhat slowly and then tacked after it has been staked it is found to be fuller and softer than when it is tacked after oiling and dried strained on the boards.

The dry leather is thoroughly moistened and then staked. After the first staking the skins should be tacked, then trimmed, given a coat of finish, dried, reseasoned, dried again and then ironed. After this

they are staked and ironed again. One ironing after the last staking may be considered enough. This method of finishing makes very fine leather provided liming, bating and tanning have been properly done.

TANNING SKIVERS.

In tanning skivers various materials are used—sumac, bark, alum, etc. If very light, delicate shades are desired sumac is generally employed. For dark shades bark makes good tannage. The skivers are of very light weight, and as they are so thin and easily torn considerable care is needed in the course of manufacture. To soften them preparatory to tanning a drum without pins is best. Instead of pins boards should be used in different parts of the drum. These soften the grain without tearing it.

FINE DESIGNS WORKED BY EMBOSSING MACHINE.

By the use of the embossing machine skivers are put into many different imitations, such as alligator, seal, pigskin, etc. The rolls used for embossing are made of steel. On these the required figure is cut; the skivers are passed through these rolls, and presto we have alligator, seal or pigskin, as the case may be. Many beautiful designs are in this way wrought, and these, in conjunction with the beautiful tints produced by aniline dyes, make very handsome effects. Many factories producing fancy leather from skivers are disposing of the whole output to manufacturers of pocketbooks, hat sweats, suspenders, etc.

SUSPENSION BEST METHOD.

When tanning skivers in bark tannage the best known method is by suspension. In this manner all danger of tearing is obviated. If instead of being suspended the skivers are thrown loosely into vats of liquor and hauled every day a good percentage of them are torn. By suspending them a smooth, even colored grain is assured and a more uniform tannage than could otherwise be obtained. Skivers are usually box colored, that is, run through the trays. They are first pleated down the backbone and then dipped in the coloring material until the desired shade is produced. Care should be exercised in putting out skivers, as they are so thin as to be damaged by the least rough usage.

UTMOST CARE NEEDED.

The utmost care is needed in the manufacture of skiver leather, no matter what tannage and finish are employed. Even in the alum tannage, which inparts more strength to the fibers than does the

vegetable, the workmen should be very careful when crutching, or softening, the skivers.

The skins being hard and having been shrunk in the drying should be dampened and left to sammy. This sammying allows the water to penetrate all parts of the skin, so that the fibers will readily give in the softening. Then, before the skins are placed in the perch to be crutched with the moon knife, they should be thrown across a horse one by one and each one pulled and stretched by hand.

VEGETABLE TANNED TIPPING AND SPLITS.

Tanners who make chrome leather from hides can realize greater profits on their poor grained hides by working them into vegetable tanned tipping than by allowing them to go through the works and then sell for No. 3 chrome, or knocked down as a joblot of culls.

REQUIRES MORE LIMING THAN CHROME LEATHER.

Good, strong tipping leather requires more liming than chrome leather. If the tanner will sort his hides after they are unhaired he can have an extra lime pit and make up a medium strong lime liquor, and all damaged grain hides can be put into this lime for from 24 to 48 hours, then put through the regular system of washing, working on the grain and bating.

After they are bated down well (tipping hides should be bated low so as to make soft, strong leather) they should be started to tan by tacking on sticks and suspended in a weak sour liquor. If a non-acid tanning agent is being used the liquor should be turned to the acid side by the use of lactic acid or Dermiforma.

THE LIQUORS.

This first liquor should stand about 7 degrees test with a barkometer. Allow the hides to remain in this sour liquor 48 hours, then handle them into another pit, or else draw off the sour liquor and pump on a fresh sweet liquor of 10 degrees strength. If they are handled over into the next pit they should be pulled out and laid in a pile to drain for two hours, in order that they will not carry too much of the sour liquor into the next pit. Allow them to remain in the 10-degree liquor 48 hours, then work them into a 12-degree liquor for 48 hours.

Now work them into a 16-degree liquor and allow to remain four days, but they must be handled each day and their position changed so they will not have any raw or kissed spots on them.

After they have been in the 16-degree liquor the required length of time they are worked into a 20-degree liquor and allowed to stay 6 days, when they are pulled from the sticks and allowed to lie in a pile

for 48 hours. They are then pressed or put through a wringer so they will be in condition for splitting, or they can be run through a splitting machine with a corrugated gauge roll without pressing or wringing. If they are pressed or put through a wringer they must be jacked on a stoning jack to remove all marks. After they are jacked they are split at a 2½-ounce gauge and the grains are then retanned in a mill with sumac, using 2 pails of sumac to each dozen medium sized sides. Boil the sumac in about 20 gallons of water and allow to stand until cool, then put in the leather and run from 1 to 1½ hours. Now take out the leather and pile down for 24 hours. When in 24 hours give it another run in sumac liquor made the same way. The leather is piled down again and allowed to lie 24 hours. It is then dipped in a tub of warm water to wash off the sumac and after that it is scoured on the table. While it is on the table, give it a good coat of moellon degras slush, made up by dissolving 4 ounces of salts of tartar in 3 gallons of hot water and then stirring into the salts of tartar 2 gallons of moellon degras. The tipping is given a slight coat of this slush, well rubbed in with a brush.

It is now folded together and laid in a pile for 24 hours and then tacked out on frames. When dry it is buffed by hand and either staked or soft boarded and pin blocked to soften, when it is ready to japan. Leather treated in this way does not require degreasing, provided a irst-class moellon degras is used. The splits are taken from the splitting machine and trimmed, then put into a mill with a weak tanning liquor 5 to 8 degrees and milled for 1 hour. This milling will break up the crust made by the belt knife and open up the split so it will take the retanning liquor.

RETANNING.

After they are milled they can be retanned in a mill or put back into the tan yard for three weeks in a strong liquor. They must be pulled out of the liquor every other day and allowed to drain about 4 to 6 hours and the liquor strengthened up and the splits put back one at a time. If the tanning is done in a mill it will take about 6 days to make a good split. They must be milled in a strong liquor about 2 hours each day, and then piled down the remainder of the day. This operation is repeated daily for 6 days, when the splits will be full tanned.

SORTING.

After they are tanned they are sorted and the heavy splits can be worked into flexibles or Goodyears, while the light can be worked into chair seats. If flexibles are to be made they are put into the mill (after lying 48 hours after the last tanning) and given a milling in a strong solution of epsom salts. This will give them a light color, without removing any of the tanning. The epsom salt solution is made by dis-

solving 75 pounds of epsom salts in 50 gallons of water. Use about 12 gallons of the solution to every 8 splits. Mill them in it 30 minutes and pile down over night. The next day set out and hang up to dry. When dry dip in warm water and lay in piles 24 hours, then give them a coat of Irish moss and soap and roll hard and hang up to dry. When dry, trim and measure.

TO MAKE GOODYEAR SPLITS.

If Goodyear splits are to be made the splits are to be trimmed so as to have the proper bend for Goodyears. The trimmings are finished in the same manner as the flexibles and sold for cheap insoles, then the bend is leveled up on the splitting machine. Bends for Goodyears must be of a uniform substance. After they are leveled they are fat-liquored with soap and cod oil, using one-half pound of soap and 3 pounds of oil to each 100 pounds of leather. Run in the fat-liquor 30 minutes and pile down over night. Now make up a clearing liquor of 16 gallons of water and 2 pounds of lactic acid. Run the bends in this 10 minutes and take out and hang up to dry. Be sure and have them dry flat. Do not hang over a stick when drying.

When they are dry make up a paste of 3 pounds of frozen glue, 1 pound of white soap, 1 pound of Irish moss and 1 quart of finishing oil. Soak the glue over night in 3 gallons of water. In the morning add the soap and moss and oil, and boil for an hour. Then add enough water to make 10 gallons and strain. When cold give the splits a good, heavy coat and hang up until it is struck in. Then roll hard and treat the other side the same way. When dry they are finished.

PROCESS FOR CHAIR SPLITS.

If the light splits are to be put into chair splits they are leveled on the machine, then put in a mill and given a milling in a sumac liquor, using 1 pail of sumac in 12 gallons of water for each 12 splits. Run for an hour, then pile down 24 hours and set out on both sides and hang up to dry. Do not hang over sticks. Trim off all the shanks and thin edges. When they are dry make up a filling paste of one-half pound of cornstarch, one-half pound of dextrine, 1 pound of casein that has been soaked over night in 3 gallons of water, and boil this mixture slowly for an hour. While boiling add one-half pound of ivory soap cut up in fine shavings. This will make 10 gallons of paste. Aniline dye of any color desired can be added to the paste and the splits made into any color. Give the splits a good coat of this paste. Put it on smooth and when about half dry roll hard and hang up to dry, when they are ready to emboss.

After embossing they are given a coat of waterproof finish, made up by cutting shellac or casein and adding aniline that is made to dis-

solve in spirits to the finish; by using analine the same color as the splits it will give the finished split a much richer color. These splits are often worked into cheap suit cases and bags.

GAMBIER TANNAGE FOR KANGAROO CALF.

A pack of 300 heavy calf should be put in a paddle wheel with a 5-degree liquor and run 3 hours steadily. For each pack, if the liquor is old, put in vat 2 or 3 gallons of 55-degree liquor, made of 5 pounds of alum and 2 pounds of salt. Strengthen the liquors of vat with 4 pails of 15 gallons each of gambier each hour, which will make 45 gallons the first day. This will bring your liquor up to 6 or 7 degrees. Next morning change the pack into another wheel with a 6-degree liquor, run wheel every 30 minutes for 1 hour. The next morning handle skins into a 9-degree liquor, do not drain until the next morning, then handle the skins in a 12-degree liquor, then in a 14-degree liquor, and next in a 16-degree liquor, and then in 18-degree liquor, and the next two days in a 20-degree liquor. Then take out, shave and press.

FAT-LIQUORING.

Fat-liquor as follows: To a 50-gallon barrel put in 20 gallons water, 2 pounds of sal soda, 3½ pounds of corn oil, 3½ pounds of hard soap. Dissolve by boiling, and then fill barrel to the top with cold water. Then run, say, 120 skins in drum for 10 minutes and give 10 gallons of this fat-liquor, and run from 15 to 20 minutes. Pack down and shave. After having shaved, put back in yard and handle for 6 days, the first 3 days in a 17, 18 and 19-degree liquor, and the last 3 days in a 20, 21 and 22-degree liquor. Then press and bring to stuffing room.

STUFFING.

If you have no press, then dry out bone dry. Dampen evenly and stuff as follows: Four hundred pounds of wet leather from the press, or 230 pounds of set leather. Put in a tub:

8 gallons dark, soft degras,
5 gallons neatsfoot oil,
1 gallon best English sod oil,
1½ pounds sal soda.

Dissolve in 3 gallons of water and mix well. Put the skins in a drum and run for 3 minutes, and then put in grease altogether. Close the door and run for 30 minutes. Take off door and run for 5 or 10 minutes. Then take out stock; do not slick off. Hang up in a cool room, 65 to 70 degrees, to dry out. If your stockroom is cool, heat up your drum a little, otherwise use cold drum.

When skins are dry let them lay if possible from 10 to 14 days. Break them in the drum as follows:

Take a 50-gallon barrel and put in:

10 gallons water,
1 gallon neatsfoot oil,
1 pound of sal soda,
1 pound borax,
5 pounds tumeric.

Boil well; then fill the barrel with cold water. Put 120 skins in the drum and give 12 to 14 pails of this liquor and run from 15 to 20 minutes; take out and color as follows:

BLACKING KANGAROO.

Three pails and 3 hair brushes are required and the blacking table should be covered with copper, with cleats at the sides and ends, so that the liquor will not run off. Then fill one pail with the sig or mordant, one pail with logwood and one pail with striker or black.

TO MAKE LOGWOOD LIQUOR.

Boil 75 pounds of the best logwood chips in 80 gallons of water. After boiling 1½ hours there will be left about 65 gallons of liquor. Take the liquor out in barrels. Just before using pour in each barrel of, say, 53 gallons, 1½ pints of aqua ammonia, 3 degrees Fahrenheit. This will change the color from a terra cotta to purple. Use the logwood at 110 degrees heat.

BLACK.

10 pounds copperas,
1 pound ground nut gall,
5 pounds bluestone,
4 gallons strong logwood liquor.

First boil the nut gall and bluestone for 1 hour in 15 gallons of water and 4 gallons of logwood liquor. Then put in the copperas and when dissolved fill the barrel with cold water.

SIG OR MORDANT.

Boil in a 50-gallon barrel 2 to 3 pounds of caustic soda and 2 to 3 pounds of salts of tartar. Fill one pail with sig, one with logwood and one with black. Then take the skins from the drum where they have been brokered, slick off with a brass slicker with a dull edge, so that the logwood will have a chance to cover the whole skin. Give a good dose of sig and rub in well to cut the grease and then one or two doses of the logwood; after this give a dose of the black and then repeat

the treatment of sig, logwood and black. Rinse off in clean water, slick off and hang up to sammy for about 2 hours. Set out hard on both flesh and grain sides and hang up to dry. When set give a good coat of cod oil. Lay down grain to grain for a few minutes, or until the oil is absorbed, then stake on machine on flesh, using a dull slicker. After this slick on grain side, using a heavy steel slicker or, what is better, a papermache slicker. Then turn the skins on arm stakes on grain side with a heavy slate lid. First stake lengthwise, then from back to belly and then rub over with a woolen rag to take off the smut. Iron the skins two ways—first lengthwise and then from back to belly. Use a 6-pound iron and have the heat just right, not too hot.

FINISHING.

Then put on finish, made as follows: Five pounds gum tragacanth, soaked for 10 to 15 days in strong logwood liquor. Put about 3 gallons of logwood liquor each day and stir thoroughly, so that the gum will dissolve easily. Do this until you have 32 gallons of logwood liquor. After the gum has thoroughly dissolved, which will be in about from 10 to 14 days, add 14 ounces of bluestone, 8 ounces of copperas, dissolved in hot water. Then 4 ounces of tincture of muriate of iron. Mix well and before using strain through a cotton cloth or a flour sack. Give one coat of finish after ironing and hang up, say, for 30 minutes and then give them a coat of this mixture:

10 quarts olive oil,
10 quarts corn oil,
5 ounces spermacetti wax. Dissolve the wax in hot oil.

Lay down skins, grain to grain, and they are finished.

SUGGESTIONS ON GLAZING AND FINISHING LEATHER.

Some leather finishers prefer to buy their seasoning liquors to making them. Very good finishing materials can be obtained ready for use, for any kind of finish and any class of leather.

For light colored leather a colorless seasoning is used, while upon black leather black seasonings, of course, are employed, and by reason of the coloring material they contain the color of the leather is deepened and improved. In many instances the grain of the leather must be cleared of greasy matter before a clear and bright finish can be obtained. For this purpose a solution of vinegar and bichromate of potash and water is used, also a dilute solution of lactic acid. To 10 gallons of water 2 or 3 gallons of vinegar and a few ounces of the potash are added. To 4 gallons of water 1 gallon of lactic acid is added.

Either of these solutions applied before seasoning and well rubbed into the grain of the leather and then dried produces good results.

GOOD SEASONING FOR BLACK GLAZED LEATHER.

A good seasoning for black glazed leather is made as follows: One gallon prepared blood, one-half gallon strong nigrosine liquor, one-half gallon bluestone, 1 ounce iron, and logwood, one-half gallon. This liquor may be diluted or not, as the circumstances require. Two or three coats of the liquor are usually required to get a satisfactory finish. The liquor must be thoroughly rubbed into the leather, dried and the glazing done after each application. The skins must be thoroughly dried before they are glazed, and if they are warm as well as dry the finish will come up bright and clear with little machine work.

GLAZING LIQUOR.

Leather always stands handling better when a very light coat of glazing liquor is applied. Some finishers after the glazing is completed wipe their leather over with an oily sponge which seems to protect the finish from moisture. The leather is merely touched with the oily sponge, since too much oil causes the finish to become gray and dull. Between the first and second applications of glazing material a solution of vinegar, bichromate of potash and water may be used not only to clear the grain of grease but to deepen the color.

FLEXIBLE SPLITS.

Use 50 gallons to 50 splits that average 7 pounds dry.

First take 2 pails sumac and boil it in a small quantity of water. Second, dissolve 4 pounds of sugar of lead and add to the above. Then fill the barrel with water.

Third, add 3 pints of muriate of tin and heat from 100 to 110 degrees. Run for 1 hour. Then put splits in a tub of cold water and let them stand for say a half hour. Then slick off and hang up and set out. When dry take down and give them a coat of Irish moss and let it strike in and roll damp. Then dry out and do the same to the other side of the split.

To Irish moss use one-half pound to a gallon of water.

FINISH FOR DULL CABRETTAS.

In the first place the stock must be fat-liquored properly. To get the feel try a few skins as follows: After the skins are blacked and ready to put the last finish on try a dozen in this manner: Take 3

gallons paraffine oil and add 1 pound oil black, D, to the 3 gallons of paraffine oil and heat until melted. Give the skins an even coat all over to get a good dull bottom. You must have this to start it right. Before you apply this bottom the skins should be blacked in the regular way and the oil black D will even them up. Make your finish of soap chips, a trifle of nigrosine on one-eighth of an ounce green aniline dye. When using the finish add 1 ounce French chalk to every gallon of finish. Most any finisher knows the amount of soap to use for a finish. If a very mellow feel is needed add a few ounces of flaxseed or Irish moss. Use borax to make it hold. Should you wish to preserve it use one-half ounce arsenate of soda to every 3 gallons. By experimenting a little on it you will get the feel wanted.

RETANNING WITH GAMBIER.

Leather that has been tanned in hemlock liquors, no matter what the finish may be, is much improved by being retanned in gambier and sumac. Hemlock has good filling properties, but it makes the leather somewhat harsh, and the black on such leather turns to a dull gray black after a time. When the stock is retanned in gambier and sumac the flanks are made fuller and firmer, the fibers are slightly contracted, the harshness of the hemlock is toned down, the leather is given a smoother feeling, and the color is deeper and less apt to fade. The results are firmer, tougher and more supple leather, a smoother grain and a more permanent black. The leather is practically tanned in hemlock and then split. It should not be dead tanned, however, before it is split. The retanning is done preferably in a pin mill or drum, as it can be accomplished in one quarter of the time required in a vat.

A GOOD RETANNING LIQUOR.

is made as follows: Boil in 80 gallons of water, 250 pounds of gambier; when this is fairly cool skim off all foreign matter. Ten gallons of this liquor are sufficient for 30 average sides of split leather, and this quantity is put into the drum with the leather, and to it are added 2 gallons of dry sumac and as much water as is needed to make the leather wet without dripping. The leather is run in the drum at least 30 minutes. It is then packed in boxes by doubling the side flesh outwards and left in that condition for 10 to 12 hours; and is then scoured or washed and treated in the usual way of coloring, fat-liquoring, etc., according to the kind of leather and the finish that is wanted.

Thirty minutes in the drum will do as much for the leather as several days will do in a pit or vat. Gambier and sumac used in this way greatly improve the leather and the cost is repaid by the improved quality. Palmetto extract may be used in place of gambier and sumac

with equally good results; and oak extract also may be employed for the same purpose.

RIGHT AND WRONG WAY OF TANNING SPLITS.

Since the chrome tannage has come into general use as a tannage for hides and skins there are many finishers of leather who have been obliged to turn their attention towards learning how to tan a hide as well as finish it, says a successful tanner. Many have succeeded in tanning the grains by the chrome process but have paid no attention to the split taken from the grain. The green splits have been sold to tanners of glove leathers, who have manufactured them into gloves, etc. Today many tanners of chrome grains are tanning out the green splits with extract of hemlock bark, gambier and quebracho and are getting various results, the stock in some instances being flat and possessing but little weight, and in others hard and tinny. Most tanners of chrome leather know nothing about a vegetable tannage; they do not understand that vegetable tanning liquors penetrate slowly or that after the green stock is once under way it must not be allowed to flat away.

CONDITION OF SPLITS MUST BE CONSIDERED.

In tanning splits taken from hides in the green state it makes a difference what condition the splits are in. Some tanners split directly from the limes, others after processing in salt and vitriol, and still others from the alum tannage.

The splits taken from the limy hides are given a slight drenching in a chemical bate to kill the lime, and then, if the tanner has the facilities, are tacked on sticks, and suspended in the bark liquors, and tanned out wholly by suspension.

The splits taken from the hides which have been processed in salt and vitriol are full of acid, and must not be given any fresh water or liquor or they will be injured. Before being placed in the liquor in which they are to be plumped sufficient salt must be added to offset the vitriol. The green splits must be in condition to take the liquor; that is, all parts must have been well softened in the drum with warm salt water before entering the bark liquor. The first, or plumping liquor, should contain at least 10 per cent of lactic acid to swell the fiber of the split so that it can take up the tannin.

The splits taken from hides started in the alum tannage need no salt in the liquors. All that is necessary is to see that all partly dried spots are well softened before entering the tanning liquor.

PADDLE WHEEL BETTER THAN DRUM.

For tanning out the splits where tanners have not the necessary vats for suspension, the paddle wheel is better than the drum. In the paddle

wheel the split is not subjected to the pounding it would receive in the drum and consequently a finer split is manufactured.

Splits for most purposes need to be well filled with tanning material; simply coloring them through will not do; they must be tanned firm. The liquors must be strengthened daily, being made stronger and stronger until the pack is tanned.

On coming from the paddle wheels, if the splits have any sediment on the surface, they should drain well and then be rinsed in a vat of water. They should not be put into a drum, have a stream of water turned on, and then the wheel started up, for it takes but a few revolutions before the splits have flatted away. It seems strange that a great many tanners do not stop to think that if any vegetable tanned leather which is put into the drum has nothing to feed on when being milled it will exude its substance and finish coarse and flabby.

THE WRONG WAY.

Not long ago I saw a tanner washing a lot of splits in the pin wheel to remove what sediment there might be on them after coming from the tanning liquors. He had a stream of water running in the drum on to the splits while the wheel was in motion, which was about fifteen minutes. The water not only washed out the dirt but the tanning also. The tanner was obliged to have the splits well rinsed before hanging them out on the drying poles, as the splits, after being dried, are taken and dampened with water and left to "sammy," and then well stuffed instead of being scoured over the table before stuffing, as the curriers used to do.

The tanner had done his work well up to the point of rinsing off the dirt, and then had spoiled a good job by putting the splits in the drum and milling them in water. If he had run up a vat with clean water, as he should have done, and put two men at work on the splits, one to throw them into the water and the other to rinse them out as fast as they were thrown in, the splits would have finished fine and have been all right.

TANNERS' EXPERIENCES.

I remember a large lot of dongola splits that were taken from a lot of leather which was tanned in the combination tannage—salt, alum and gambier. The splits were sold to a currier for so much apiece.

The currier who bought the splits sent them to two different curriers to be tanned in bark. One of the tanners to whom he sent the splits was an old-fashioned tanner who did not understand the effect of salt and alum in bark liquors. The other tanner was one who had had considerable experience with salt and alum in his bark liquors in tanning sheepskins and other classes of stock, and knew well how to remove these substances without injury to the stock.

The first mentioned tanner put the splits in the pin wheel and washed and rewashed them in warm water until he could not taste any salt or alum. This was a waste of time, labor and of what tanning material there was in the splits when they reached his tannery. It was also detrimental to the after plumpness and solidity of the splits.

It has always been the cry of tanners that if stock be allowed to flat away at any stage during the tanning process after being plumped, it was good-bye to finely finished leather; and still this tanner, who had the reputation of being as good and careful a tanner as there was in his section, had heard so much about salt and alum "spewing" out on leather that he was afraid it would happen in this case.

After washing his splits he put them in the handlers to plump them, but after handling them for a week he found that they did not plump the way he had expected they would. After repeated hauling and setting back for a number of weeks the splits were delivered to the currier who owned them.

The splits neither looked nor felt like anything in the line of leather that the currier had been accustomed to finish, and he made up his mind that if this was the way the splits were coming out he would not purchase any more of them. He started out to see tanner No. 2 and asked him how his splits were looking. He was told that they were growing well and that they were plump and taking on good weight. A pack was hauled out of the handles and the splits were found to be in splendid condition; they were plump, mellow and well filled.

The currier said he could not see why there should be so much difference between these two lots of splits. He said that the first tanner had tanned many thousands of hides for him and they had always been tanned in first-class shape; the leather had finished fine and had given satisfaction to the shoe manufacturer. He said that had he given all the splits to that tanner he would have thought that no one could do anything with them, and would not have bought any more of them at any price.

The tanner whose splits came out all right did not try to rid the splits of salt and alum; he simply milled them up in extract in the pin wheel and then handled them out in strong liquors until tanned. When tanned they were rinsed in a vat of clean water and then hung out on the poles to dry.

SALT NOT DETRIMENTAL.

Salt is not detrimental to bark liquors and will not be an injury to the leather, if used as it should be. The time and place to use the salt is in the first liquors when the packs are green, and when the packs are shifted into the liquors where no salt has been used the fresh liquors will take it all out.

WORKING GOATSKINS.

In working goatskins through the beamhouse for chrome tannage the experienced foreman follows no set rule. Judgment and experience are the guides, since there are many varieties of goatskins, each having peculiarities of its own. It has been demonstrated many times that a tanner who works in anything and everything in the goatskin line does not succeed like the one who makes a specialty of only one kind. The man who makes a close study of a certain raw material soon learns its needs and, rectifying past mistakes, becomes an expert in working this particular kind of skin.

SOAKING.

Goatskins come to the tanner either in a dry flint or dry salted state and to get them back to their natural condition soaking in water is resorted to. The length of time necessary to accomplish the desired result varies in accordance with the condition of the skins and must be determined by experience. Soaking softens the skins, and removes the dried blood, salt and dirt, substances which if not removed before the liming process are a source of danger.

After the skins are softened they are ready for the fulling mill, which breaks up the glace on the flesh side and softens the connecting fibers. The skins, on being returned to the soaks, absorb the water readily and the soaking proceeds rapidly. The fulling mill is much better for milling goatskins than the drum or pin wheel. In the fulling mill the skins are punched back and forth and gradually warmed up. This warming has a tendency to further soften the skins. In the pin wheel, or drum, warm water is necessary to add weight to the skins, so that in falling against the pins they strike heavily. The skins on coming from the fulling mill are in a warm condition and should not be neglected. If allowed to lie around in piles they generate heat rapidly.

The soaks should contain cool, clean water, or there is danger of putrefaction setting in and the skins being pricked. The danger of putrefaction may be greatly lessened and the soaking process hastened by adding borax to the water. Borax is a mild alkali, has great softening properties, and never causes a harsh grain like many other chemicals used. In soaking more uniform results are obtained if the skins are assorted from the bales and the heavy medium and light soaked separately.

LIMING PROCESS.

The skins after having been well soaked are ready for the liming process. For goatskins, to insure a smooth, fine grain, fairly old

limes are necessary. Red arsenic is a valuable aid, if used in proper proportions with lime, the lime being the agent which splits up the hide fiber. Arsenic attacks the hair first, and if it be depended on as the depilitant the resultant leather will be hard and tinny, although the stock unhairs easily on going through the unhairing machine. Red arsenic prevents an excessive plumping of the skin, softens the grain and prevents it from becoming rough, and also saves a large amount of hide substance from being dissolved. Arsenic is preferred to sulphide of sodium in the liming of goatskins. When red arsenic is used the finished leather takes on a bright gloss and remains soft and silky, whereas in many cases where sulphide of sodium is used the finished leather grows hard and tinny.

Lime when used alone swells the skins rapidly, but acts on the hair sheaths very slowly and before the hair is ready to start, the fiber of the skin is apt to suffer. In slacking the lime care should be taken that all particles are thoroughly slacked before placing the solution in the lime liquor. While the lime is slacking the red arsenic may be added in the proportion of two pounds to a bushel of lime and thoroughly stirred into the liquor.

THE BRAN DRENCH.

After the skins have been slated the next comes the bran drench. For this one should purchase that grade of bran known as "middlings." Although the first cost of middlings is more than the coarser bran, the results are enough better to warrant the additional expense. From 100 to 150 lbs. of middlings may be used to 500 goatskins of average size. The exact amount cannot be given, since the drench is affected more or less by atmospheric conditions, by the variableness in quality of bran and by the difference in condition of the skins on going into the drench. I have found that bran gives less trouble—that it lumps less—if it is first mixed to a very stiff paste in cold water, then thinned down with more cold water and finally added to boiling water in the vat where it is to be used. It should then be boiled and well cooked. The tanner who has always used coarse bran instead of middlings may not see the necessity for this careful mixing, but one trial will convince him.

Some tanners do not cook the drench; they simply mix fresh bran with the required amount of water, add a bucket of sour bran, heat to about 90 degrees and put the skins in. In a drench prepared in this manner, however, the skins do not go forward as rapidly as in the boiled drench. But whether the drench be cooked or not, the bucket of sour bran should be used to hasten fermentation. If one is making up a first drench, and no sour bran is at hand, a yeast cake or a gill of vitriol may be added.

The drench having been prepared and heated to 90 degrees Fahren-

heit in summer, or a few degrees more in winter, the skins should be wheeled alongside the drench, and several men set to work placing them in the vat that the work may be carried forward as rapidly as possible and the temperature of the drench will not be lowered too much. Too low a temperature does no harm except to retard the action of the drench, but too high a temperature may be ruinous to the skins. A man of experience will hardly use a drench sufficiently hot to convert the skins into gelatine, but I have known men of some experience to fail to exercise care in breaking up the lumps as they mix the middlings. The result was that the lumps, which retain the heat, on striking the skins converted the spots they touched into gelatine. I have also known men of some experience to use a drench sufficiently hot to cause the skins to crack.

CARE IN PREPARING BRAN DRENCH.

The drench should be mixed early in the day and it will be ready for the skins by night. After placing the skins in the vat, the vat should in winter be covered to retain the heat, in summer it should be covered or uncovered according to the temperature of the atmosphere. The length of time which the skins should remain in the drench varies, but, if the drench has been properly developed, and the atmospheric conditions are right, the skins will in the morning be found to have risen to the top of the drench, in which event they should be well pushed down and left to rise a second time. This plunging should be repeated as often as the skins come to the surface. When, after plunging, they fail to rise, they should be removed from the drench and prepared for the tanning.

If, however, the drench has not been properly developed, the atmospheric conditions were not right, or for any reason, known or unknown, the drench shows on examination in the morning that the skins have not risen during the night, the skins should be hauled out, a little more bran and a gill or two of vitriol should be added to the drench, and it should again be brought up to 90 degrees Fahrenheit and the skins once more placed in the bath. One should then proceed as above directed.

WASHING.

On finally coming from the drench the skins should be washed in warm water. They may then be put in the paddle wheel and given a weak solution of lactic acid, previous to tanning, or they may be tanned without this lactic acid treatment. It is my opinion that the lactic acid treatment gives a softer grain than when the skins are tanned directly from the bran drench.

If at any time it be found necessary to put skins in the drench Saturday night, they may be safely left there over Sunday by putting

less sour bran in the drench and by having the drench a little cooler at the start.

Some tanners today are mixing bran with the excrement of the hen and are showing good results in the fineness of grain of their leather.

Before finishing this article on the bran drench I want to again call attention to the superiority of middlings over coarse bran. In genuine Russia leather we have an example of what can be done with flour in the manufacture of leather. The Russian method of killing the lime in the skins differs somewhat from ours. After the skins have been unhaired and fleshed, the Russians use a fermented bath of flour, salt and oatmeal. This gives a grain of unsurpassed suppleness and beauty.

TWO-BATH PROCESS PREFERABLE FOR GOATSKINS.

Of the two methods of chrome tannage in use many tanners prefer the two-bath process for goatskins, claiming that in this tannage the fibers of the skin are split up more evenly than in the one-bath. Others claim that just as good leather can be made with the one-bath at less expense than with the two.

The proportion of material to use in this tannage differs according to the nature of the skins. When using the two-bath process it has been found that on skins of an open nature five pounds of bichromate of potash and two and a half pounds of sulphuric acid are sufficient for 100 pounds of raw material, but on close, fine-pored skins six pounds of bichromate and three pounds of acid must be used for 100 pounds of skin. Enough salt ought to be used in connection with the solution to control the action of the acid or the skin will become rubbery and shrink in measurement.

SALT AN IMPORTANT FACTOR.

Salt is an important factor in both of these chrome processes and a sufficient quantity should be used to control the acidity. Neglecting to use salt, or neglecting to use a sufficient quantity of it, has been the main cause of failure in making chrome leather. If there happens to be more acid used than is necessary to form chromic acid in the first bath the salt will take care of the acid and prevent mischief being done.

PROCESSING.

In the two-bath tannage the skins are given a light processing in the drum in a solution of salt and vitriol directly after coming from the beamhouse and then after being processed are allowed to drain over night. This opens the pores of the skins and on receiving the bichromate of potash solution they take the material rapidly. If the

skins have been sorted according to size in the beamhouse before soaking they will be tanned uniformly and struck through alike with the yellow shade. When this is accomplished the skins should be horsed up over night so that the tanning liquor has sufficient time to do its work thoroughly. Time is a factor in the chrome tannage as well as in the vegetable and simply striking the tanning into a skin sufficiently to color it through is a long way from perfect work. A thing to be carefully guarded against in the first bath is that the skins do not dry on the edges.

After having been horsed up for ten or twelve hours the skins should be put out on the machine to remove the surplus liquor, and also to remove the wrinkles, for if the wrinkles are not removed at this point they are made rigid in the second bath and cannot be removed.

In the second bath the chromic acid is reduced to oxide of chrome by the use of numerous reducing agents such as hyposulphite of soda, bisulphite of soda or sea salt. The most commonly used of these agents is hyposulphite of soda. The acid most used in connection with the hypo in the second bath is muriatic, and it is considered by many that the danger of precipitating sulphur is less when using this than when using sulphuric acid.

DO NOT HURRY THE SKINS.

The amount of acid and soda to use to reduce one hundred pounds of skins depends on the condition of the skins from the chrome bath. As it takes soda and acid to reduce the chrome, it can readily be seen that the harder the skins are struck out on the machine the less chromic acid they contain and the less hypo will be necessary to reduce the remainder. As a general thing twelve pounds of hypo and three pounds of acid to 100 pounds of skins will reduce the skins and the blue shade will be found on cutting the skins to have well penetrated. Here, as in the first bath, one should not hurry the skins after the blue shade has shown to have penetrated the skins thoroughly. The leather is only tawed, and the tawing process does not become firmly fixed to the fiber until the leather has been dried out. Many a mistake has been made at this point by taking the skins from the reduction bath as soon as the blue color has shown up and washing them in alkaline water to remove the acid. It is well known that in the alum tannage, which is a tawing process, the longer the skins can lie in the crust the better the finished leather. In the chrome process the tanned stock cannot be dried out before finishing, but it can lie in a wet state out of the reduction bath for some time without injury if kept from drying on the edges.

This point has been proven to the satisfaction of one tanner, who has today at least a week's work tanned ahead lying in stock ready

for the washing process. The point was made clear to him through an accident to the machinery of the plant, the machinery being incapacitated for about a week. It was found that the skins, over which considerable worrying had been done for fear they should spoil, finished in splendid shape and made the finest stock the factory had ever turned out, being mellow and silky.

Some tanners argue against leaving the skins out of the reduction bath more than twenty-four hours before washing, claiming that the longer the acid stays in the skins the worse it is for the finished leather. The fallacy of this argument is proven by the fact that skins lie in a processed state for a number of years without injury if properly cared for.

DIFFERENT SKINS REQUIRE DIFFERENT TREATMENT.

We spoke of the superiority of red arsenic over sulphide or sodium for liming goatskins for glazed kid. Elasticity, softness and strength are essential in this class of leather. The length of time required to properly lime goatskins depends on the tightness of fiber of the skin, the strength and temperature of the lime liquors. Skins vary in structure and substance according to the country from which they come. Different skins need different treatment in the beamhouse, and no rule of thumb can be given. One must learn from experience.

Some tanners test skins from the limes with the thumb, assuming that if the hair starts easily liming has been carried far enough. This test should not be depended upon, since the hair sometimes starts before the stock is put into the limes. This often happens when the skins were sweated a little before or after milling in the hide mill.

TESTING THE SKINS.

The best tanners depend principally upon the eye to tell them when a pack of skins is limed sufficiently. If the skins are properly limed, the flesh side shows the flesh raised and ready to be cut away easily in the fleshing. If not sufficiently limed the flesh is tight and instead of being taken off easily it cuts hard and stringy. In this case skins are unsatisfactory and considerable time and labor are wasted. On the other hand, if limed too much, the fibers are weakened and mushy flanks and bellies result.

Some tanners working in hard, tinny skins pack them down in piles for a day or two before milling, to soften them by sweating. Sweating softens the hair sheaths as well as the body of the skin, and, if carried too far, the hair comes off in the hide mill, leaving the grain of the skin perfectly clean. This should be guarded against, since severe sweating is apt to result in a harsh grain when the skins strike the lime liquor.

LIMING GOATSKINS FOR GLAZED KID.

In liming all classes of goatskins for glazed kid care must be taken that the grain is kept from becoming rough and also that no undue plumping of the skin takes place. To prevent roughness and over-plumpness there is nothing better than red arsenic, used in fairly old limes. This depilatory is preferable to any other. It is true that good, salable leather is made by using sulphide of sodium instead of red arsenic in the limes, but such leather is manufactured from goatskins of a sheepy nature, skins which have a natural stretching of fiber. Many tests have been made of sulphide of sodium in unhairing goatskins. They have proven to the satisfaction of many that it cannot be successfully used alone on the average goatskin.

THE PADDLE WHEEL

is in general use today for liming goatskins, and by it skins are limed more uniformly and at less expense than was possible when still limes were used. After having been properly limed goatskins should be taken from the limes, well drained and placed in the water pits.

It is a mistake to let the skins lie around exposed to the air. The grain of the skin on coming from the limes is rough and harsh, and, if exposed to the air long enough to partly dry, the lime crystallizes on the surface, and when the unhairing knife strikes such a spot the grain is scratched. It is difficult to tan these spots, since the tanning material enters from the flesh side. These spots also cause trouble in the coloring room. The dye does not penetrate and chemicals must be used to force the spots to color. This answers on black spots, but not on fancy colored leather if one desires to turn out a first class, even color.

The water in which the skins are to be placed after coming from the limes should be of the same temperature as the lime liquor. If the water is much colder than the lime liquor the skins plump and are more difficult to unhair.

The limed skins should lie in the water pits 12 to 15 hours before being unhaired. The rough grain is softened by the action of the water. After being unhaired and unfleshed the stock is well washed in the drum and is then ready for the puering process.

PUERING.

Puering is generally done in the paddle wheel, the excrement of the dog, the hen or the pigeon being used for the purpose. Excrement of the dog produces the finest results, but as this can only be obtained in small quantities, hen or pigeon manure must usually be used. Owing to the peculiar structure of the goatskin—its tightness and its tendency

to roughness—a chemical bate cannot be used with any marked degree of success. Perhaps I should say has not, as yet, been used with any marked degree of success, for the chemist has already accomplished so many seeming impossibilities for us that our confidence in him is daily increasing.

Excrement of the hen is most commonly used today for puering goatskins. Care should be exercised that no gravel stones be left in the puering solution. To prevent this the steeped solution should be strained before going into the drench. The skins are usually left over night in the puer and then slated the following day. Slating not only cuts down the coarse grain, making it smooth, but it removes the short hairs and scud and considerable lime.

Morocco finishers fully realize the importance of putting out a skin in good shape after it is colored so as to have it finish fine. It is of as much, if not more, importance to work down the coarse grain of the skins after being drenched. Here the grain is soft and silky and gives readily under the stone. The stone gets down into the body of the grain and does not scratch as would a harder tool.

BEFORE SLATING

the skins should be placed in a tub of warm water. Water not only keeps the grain soft, but washes off any pebbles which have, in spite of the straining, found their way into the puer liquor. One little pebble may do a large amount of damage. It not only injures the skin with which it comes in contact, but it nicks the edge of the stone and if the stone be not attended to the workmen go on scratching skin after skin. These scratches do not show up readily in the beamhouse, but after the stock is finished they are plainly seen.

After having been tanned the skins should be thoroughly washed to remove the acid. Ammonia, soda and borax are used for this purpose. Although the cost of borax is somewhat greater than that of other named alkalies, yet it gives the best results where a soft, velvety grain is wanted. It not only gives a silky grain, but prevents any blowing of the skin. Washing is accomplished in the paddle wheel or in the drum, and when all traces of acid have disappeared the skins are rinsed in clean water to remove the alkali. After being rinsed in clean water the skins are struck out to remove surplus water and shaved on the shaving machine. When shaved they are ready for coloring.

At this point many mistakes are often made. Too much cannot be said in regard to waste or in regard to the use of too strong fresh logwood or hematine. In the chrome tannage chromic acid is reduced to oxide of chrome and the use of fresh logwood to get a black surface is injurious to the leather and wasteful. The only form of logwood

that will give satisfaction with non-oxidizing mordants in my opinion is hematine.

If fresh logwood is to be used, a mordant of oxidizing properties must first be applied to the pale green surface. For this purpose a sig of bichromate of potash and salts of tartar may be used, or the skins may be dipped in a solution of permanganate of potash. This makes a foundation and the coloring is then easily carried out. For the dark shades of tan nothing is known by manufacturers or chemists that will take the place of permanganate of potash. It not only kills the acid, thus saving half the cost of making, but produces the dark bottom so much desired by colorers of leather. After the potash has done its work the leather is rinsed in water and is then ready for the coloring. If intended for black stock, an analine is used of a blue shade, which makes a blue flesh, penetrates the leather, and the foundation on the grain is made for the black. By this method there is a great saving in logwood, a better color is produced on the grain and with less expense. If too strong a hematine liquor is used the grain of the leather becomes coarse and trouble is encountered when the skins are seasoned.

DYEING.

A dye liquor of just sufficient strength to produce a good black should be used, but it should not be strong enough to injure the leather. A little experience will teach the colorer how strong to make the dye liquor. For a striker many use copperas and blue vitriolin combination. While this black may be all right to use on vegetable and alum tanned stock, it is found that chrome tanned leather is made tender by its use and it is also one of the causes of spew. During the coloring process the acid in the copperas (sulphate of iron, or green vitriol) is liberated, and this, uniting with the grease, comes out on the surface of the finished leather after lying in stock a short time. This condition has puzzled many a tanner who well knew that no acid had been left in the leather previous to coloring. On chrome tanned stock the grease is not sufficient to overcome this acid, the leather being unable to carry a sufficient quantity. In vegetable tanned stock, however, large quantities of grease are readily absorbed by the leather and this grease kills the acid.

PREPARED BLACKS FOR CHROME TANNAGE.

Numerous prepared blacks for chrome tannage are on the market and give good results. The leather should be of a good rich deep black before leaving the coloring room, for if poorly colored it must be touched up in the seasoning. This makes it necessary to put coloring material in the seasoning and is the cause of the seasoning flying. Skins that have been perfectly colored require less seasoning than those that have not. On perfectly colored skins it is necessary to use only

sufficient seasoning to properly fill the skins, so that on being glazed on the glazing machine a good bright gloss results. After the leather is well colored all surplus coloring should be gotten rid of by giving the skins a good washing in water.

TO INSURE A GOOD COLOR.

Some colorers, to insure a good color, whether it be black or a fancy shade, use some vegetable tannin for a bottom. Gambier, quebracho and hemlock extracts are used. In using any of these tannins considerable care must be exercised that the liquor be of only sufficient strength to color the grain, or the chrome stock will take on that appearance of vegetable tanned leather and be weak of fiber. Then again, if carried too far, although the skin is tanned, the grain draws, and the wrinkles cannot be set out in finishing.

After the skins have been well washed to remove surplus coloring, they are allowed to drain to receive the fat liquor. Here considerable trouble is encountered. No two lots take fat liquor alike, and, since the quality and value of the finished leather is greatly affected by the fat liquoring, considerable judgment and experience are needed. Formerly potash soap was used largely in cutting the oils and greases, but potash makes leather rubbery and is not now used to any great extent. Neatsfoot oil and degras are good, cut with fig soap and borax, also degras and egg yolk. For the manufacture of the finest chrome leather it seems that the safest degras to use is the French, although it costs more than domestic brands.

PREPARED FAT LIQUORS.

Many tanners of goatskins have tried a prepared fat liquor manufactured by oil dealers, and are fully satisfied that the preparation is far better than one mixed in their own plants.

Whatever is used for a fat liquor, the drum should be heated to about 140 degrees Fahrenheit. With live steam, the water runs off and the skins placed in the drum. The drum then should be run for a few revolutions to allow the leather to warm up, and the fat liquor, heated to the proper temperature, should be fed gradually to the skins. After the fat-liquoring process is completed the skins should be horsed up for a few hours, then put on the machine and finished in the usual manner.

TO MAKE YELLOW BACK BARK-TANNED KANGAROO SIDE LEATHER.

Small, clear grain sides are the best. Split the desired weight and re-tan in a combination liquor of hemlock gambier and alum, using a 25 degree liquor made up of one-half gambier, one-half hemlock

extract. To twenty-five sides give four pails of the liquor and four pounds alum dissolved in two gallons water. Run three-quarters of an hour and pile down over night, then hang up to dry. When dry dampen for stuffing.

STUFFING.

When ready for stuffing, use the following stuffing: 12 pounds German degras, 12 pounds oleo stearine, sub. 5 pounds fish oil to each 100 pounds leather, weighed after dampening. Use stuffing at 140 degrees. Pack down over night to harden, then set out good by hand. When dry buff off the grain, trim and stoke well.

COLORING.

Now make up a yellow back liquor, using aniline yellow No. 25041, Hartford & Hanna. The amount of yellow dye to use depends on how deep a yellow is required. The yellow back is put on with a finishing machine. After the yellow back is dry, black the same as any buffed leather is blacked on a machine. Then roll and paste with the following paste: 2 quarts flour, 10 quarts water, ½ pound tallow, ¼ pound beeswax, ½ gallon linseed oil. Boil one-half hour and then add ½ pound good soap, 3 ounces black nigrosine and boil fifteen minutes. When cold, strain, and if too heavy to run on machine, add water to thin down to required thickness for use on the machine. Give the leather a fair coat of the above paste and when dry, roll.

FINISHING.

In the meantime, make up the following finish: 1½ pounds casein, 1¼ pounds olive green soap, ½ pound tallow, ½ pound German degras, 1½ pound fish glue, ½ pound black nigrosine. Boil one hour, cool and add 1 pint ammonia and strain. This will make 6 gallons when done. Now make up into another tub the following: 1¾ pounds Irish moss, 1¼ pounds olive green soap, ½ pound borax, 2 pounds flour, ½ pound nigrosine. Boil one and one-half hours; when cool, strain. This will make 6 gallons when done. Mix one-half of the first and one-half of the second finish and use it on the machine. It will give a medium bright finish. If the finished leather is too bright, use more of the moss finish. If a bright finish is required, cut out the moss finish. Give two coats on the machine and, when dry, roll. If boarded kangaroo is required, be sure to have the leather boarded before the paste or finish is put on the leather.

FAT LIQUOR FORMULA.

When stock comes from the tan, press out surplus liquor, or lay in pile to drain for forty-eight hours.

Heat drum well, preferably with hot air, and add 1 gallon No. 1 clarified leather oil to each 150 pounds of stock, weighed after being well drained or pressed. Run for forty minutes, or until the oil is well taken up. Now take stock from drum and hang up to dry; after drying weigh the stock and wet it in a tub and pile it up for twenty-four hours to soften. This is better than softening in a drum, for it will not pipe the grain.

Shave if necessary to level them, and then put the stock in drum and run with just enough water to wet all parts alike, drain off any water in drum and add twenty gallons of fat liquor to each 100 pounds dry weight stock; have temperature at 110 Fahrenheit. You may use more or less as the particular tannage will carry, this being a maximum amount.

Run until fat liquor is well taken up, hang up and dry stock out again.

FAT LIQUOR FORMULA.

Fill a barrel half full of water, dissolve 25 pounds of Palermo fig soap, then add 50 pounds of English sod oil and 1½ gallons No. 1 neatsfoot oil, saponify thoroughly, add water to make a total of 50 gallons.

RECIPE FOR FAT LIQUOR.

Take 80 pounds Take-A-Nap soap.
Take 10 gallons cottonseed oil.
Take 4 pounds Irish moss.
Take 1 pound salicylic acid.

The soap should be dissolved by boiling in ten gallons of water; then add the oil slowly, so as to thoroughly mix with the soap. Boil the moss until it is well cooked in ten gallons of water, then strain, and add the soap and oil solution. Dissolve the acid and add to the solution with enough water to make fifty gallons of fat liquor.

CLEANING UP BLURRY KANGAROO.

Use one pound of carbonate of ammonia to forty gallons of water. Put stock in mill and run for twenty minutes. Then set out and finish as usual. The blur on kangaroo comes largely from fat liquors not being properly cut, and also from poor, cheap oils. The blur will come out after the stock is finished. Using this will clear it up. This has been used on kangaroo and dongola with good success.

FINISHING KANGAROO FROM MADRAS KIP.

When the leather is split up the back, have the water in the tank heated to 75 degrees. Take twenty sides and place in the tank or vat. The sides should be taken out in the order that they were put in so

that each will have remained in the vat about three minutes. Particular pains must be taken to prevent the sides from becoming too wet, which could cause trouble in splitting. The leather should be laid in a pile over night. Next morning take twenty to twenty-five sides and drum until soft enough for splitting. Trim them evenly for the splitter and save the trimmings in sacks, as they sell well. If the sides are not trimmed they make trouble in the finishing room and result in a waste of grease and labor.

RETANNING.

When the leather is split from 4 to 6 ounce or whatever substance is called for, they should be retanned in a drum, fifty sides at a time. Madras kip are not always thoroughly tanned. It is important to get them soft before giving a strong tanning. The writer has had several years' experience with East India kip, both in this country and abroad, and here gives his best method of tanning and finishing.

BEST METHOD OF TANNING AND FINISHING.

Place fifty sides in the drum and give six pails of 12-degree gambier liquor. Run them fifteen minutes or so and then take them out and pile up two days at least to soften. If you give them a stronger liquor they will not plump so well. After two days give them seven or eight pails of 16-degree liquor in the drum and leave them two days more to soften and plump up.

The third time you can give them 20-degree liquor and mill only a short time, so as not to pipe them. If the leather is intended for a box finish, use a weaker liquor and sumac well.

FOR THE KANGAROO FINISH.

the leather will stand a good strong tan and will take the grease well and prevent piping in the finishing room. Besides, you will have fuller flanks if you tan the kips slowly and often, and do not drum more than enough to have the leather take the tannin up. After the last tanning the kips should lay a few days so as to get the benefit of the tanning.

Madras kips should be dried in a loft. If hung out of doors the leather will be much softer. If dried in heat the fiber will be closer and there will be less danger of piping of the grain, as it is well known that this class of kips is naturally loose.

After drying, dampen them in the usual way by dipping in luke warm water. The sides should be dipped quickly, so as not to become too wet. One hundred pounds of dry kip ready to dampen should not, when dampened properly, have absorbed over forty-five pounds of water. Before stuffing the sides should lay in a pile two days, so that they will sammy up even. Heat the mill 150 degrees Fahrenheit and the grease should not be hotter than you can hold your hand in it.

They will take the grease readily if you have the leather in good condition.

GREASE.

Make your grease as follows in one kettle: Sixty pounds brown grease, good color; ten pounds paraffin wax; ten pounds common degras; one gallon moellon degras. Some curriers do not add the moellon until the grease is put in the drum to prevent boiling over in the kettle. For average leather, sixteen feet to the side and about four-ounce leather, allow two pounds of grease. If the leather is split to over four ounces, give two and a quarter pounds per side.

Run the stuffing drum twenty minutes. Cool ten minutes, then set the sides out on the machine on the grain side and set by hand on the fleshing side with a slicker. Turn the sides over on the tables and set on the grain with stone and slickers. A good day's work is sixty sides when set properly.

After the leather is dry out of stuffing, it should be packed in a pile a few days to ripen. If a yellow back is desired, add one-half pound of Aurmine. Simply dissolve it in half a gallon of hot water and add to the grease before putting into the mill. It will mix evenly with the grease and the leather.

BLACKING.

Buff light and trim and the sides are ready for blacking on the machine. Make your blacking as follows: Take one pound gum tragacanth in forty gallons of water with three pounds of pure olive oil soap and boil one hour. Add five pounds logwood extract, five pounds nigrosine, one to two pounds borax and cook twenty minutes more. Dissolve five ounces bichromate of potash in a half gallon of water. Add to the above slowly, but do not cook any more.

If the leather is hard to black, add ammonia, say two quarts to the barrel. If properly cooked it will black in one operation by having the machine in proper condition. Some tanners black and hang up to dry and black again when dry. No iron or copperas is required. After the leather is dry it is rolled on the grain side and grained one or two ways as required. The leather is then finished on the machine.

RECIPE FOR BRIGHT FINISH.

Here is a recipe for a bright finish: Five pounds borax in twenty gallons of water. Bring to a boil; add half gallon of ammonia and twenty-five pounds of orange shellac and boil one hour or so.

Cook seven pounds of logwood and four pounds of nigrosine in twenty gallons of water. Add this at the boiling point to the shellac solution, making a total of forty gallons. When perfectly cold add

six gallons of beef blood and four ounces of carbolic acid. Add ammonia to suit your work. Give the leather two coats if a bright finish is needed. If a dull finish is required you can use gum tragacanth to dull it down.

DAUBS AND MIXING PAINTS FOR ENAMEL, PATENT AND FURNITURE LEATHER.

For daub for enamel leather, boil linseed oil until it is like jelly. This takes about twenty hours, and about five hours extra for the addition of naphtha. To make ten gallons, the kettle it is boiled in should hold twenty gallons, or twice as much as the amount of the oil. The latter is slowly brought up to 575 degrees Fahrenheit during the first ten hours. When it is left at the end of the day's work, the temperature is allowed to drop to about 390 degrees. The second day it is raised to 600 degrees, and at the end of the second ten hours' boiling is cooled down to 390 degrees. The naphtha is then added on the basis of 1¼ gallons to each gallon of oil. To illustrate: If we are boiling ten gallons of oil and it is ready for the naphtha, pour four gallons of naphtha in, under constant stirring, and when well absorbed add four gallons more, and so on until 12½ gallons have been added. If you wish to make black enamel, add five pounds of the best lampblack and stir well until all is united.

Enamel varnish is made of linseed oil and Chinese blue boiled together and reduced with naphtha.

Black varnish is made of linseed oil and raw umber, with lampblack added on the basis of about one-quarter of a pound to one gallon of oil, and is reduced with naphtha so that the mixture can be applied freely with a brush.

For furniture leather apply three coats of daub same as for black enamel and then paint any color wanted with colors that can be bought ground in oil.

PATENT SHOE TIPPING.

A very good way to fit bark-tanned leather for patent shoe tipping is to split and shave it on the machine, then for fifty medium-sized sides dissolve three pounds salts of tartar (carbonate of potash) in fifty gallons of water 80 degrees Fahrenheit, run in a mill for one-half hour, then drain and wash for fifteen minutes. Have made up the following re-tan liquor: Boil two pails good sumac in forty gallons water ten minutes, allow to stand over night; in the morning dissolve twelve and one-half pounds extract of gambier and add to the sumac, and ten pounds salt. Have fifty gallons in all. Run the sides in this re-tan liquor one hour; use liquor at 80 degrees Fahrenheit, then pile down on floor for twelve to twenty-four hours; then throw into a

tub of water to wash off the spent sumac. Make up the following pot liquor and run hides in the same for half an hour; put out and tack; when dry, buff, grain and stake. Boil one pound fig soap until dissolved, add four and one-half pounds cod oil; boil one-half hour, then turn off steam and stir in four and one-half pounds good moellon degras and mix well. Now add four ounces salts tartar dissolved and fill barrel to make fifty gallons. Use at 110 degrees Fahrenheit. This will make a strong, fine tipping leather that can be easily japanned.

Harness, Skirting, Collar Leathers, Etc.

BLEACHING WHEEL-STUFFED HARNESS LEATHER.

It is useless to bleach the flesh of harness leather before wheel-stuffing it unless it is hand-stuffed after being wheel-stuffed. To bleach wheel-stuffed harness leather, have a tank five feet long, four feet wide and four feet deep constructed at the right-hand end of the table. Fill the tank with clean water and raise the temperature of the water four degrees above the melting point of the grease used for stuffing the leather. Place a pail filled with clean water on the left-hand end of the table, add one-third of a pint of axolic acid to the water and raise the temperature of the acid solution to the boiling point. The temperature of the solution should be kept high by repeated applications of steam. The sides being placed spread out upon another in a pile on the floor handy to the workman, fold a side flesh in by laying the one end over on the other, then fold again by laying the two ends over on the fold which is at the center of the side, lift the side and immerse it in the tank of hot water. Let go hold on the side and keep it under water with a stick half a minute, then lift it from the tank and place it on the table flesh up, brush the flesh, slick it, then brush it over with the acid solution, brushing the nap in the right direction for glassing and hang up to dry.

RUSSET COLOR ON OAK SKIRTING.

The following recipe is from an experienced tanner:

Place 25 sides of leather in a drum with 7 pails of lukewarm water in which 6 pounds of borax have been dissolved. Run for 15 minutes. Then add two or three pails of water to the leather in the drum. Do this through the axle while the plugs are out. This will wash off some of the extra tannin.

Now put one gallon of sulphuric acid into 30 gallons of water. Replace the plugs in the drum and give two or three pails of the acid solution to the 25 sides of skirting and run for five to nine minutes until it is evident that the leather is clear. Take plugs out of the drum and wash well until there is no taste of acid from the water or the

leather in the drum. More or less acid can be used, according to one's judgment.

To get a nice clear color, add to your sumac bath one teacupful of tin crystals, which have been dissolved in a pail of water. To this mixture add one cup of muriatic acid, so that the sumac bath will contain both of these ingredients.

All tanners sumac their skirting. Oil slightly out of sumac, giving merely good cod oil cut down with a little paraffin oil.

I would repeat that after the tin crystals are dissolved in water the acid should be given to them and both of these dumped into the sumac. I repeat this, so that my instructions will be understood. If properly carried out, the tanner ought to get satisfactory color.

MAKING COLLAR LEATHER.

We will take 25 sides from tan, using 7-ounce leather, which is mostly used for either black or russet collar leather, says an old hand. After leather is tanned and shaved, put 25 sides in drum, which should contain 50 gallons of water, at 150 degrees of heat. Add four pounds of powdered borax and run the drum 15 minutes. Leave out impurities and then add to the leather in drum 10 gallons of water, to which has been added one quart of sulphuric acid, thus making a diluted acid liquor. Run 10 minutes in drum. Wash off five minutes with cold water, then press, but not too dry. Mill five minutes to take out press marks.

The sides are now ready for stuffing. Heat drum and mill 10 minutes. Put in leather and add three gallons of cake tallow, which has been melted at 150 degrees of heat. Run 20 minutes, cool off five minutes, then set leather on machine, or by hand, on grain side first.

Hang up to sammy for an hour or two. Then reset on grain side, being careful to dampen dry spots. Glass on grain side nice and smooth, then turn over on flesh side, from which the waste grease should be slicked off, and the flesh side glassed.

If sides are for plain russet color, it is well to wipe over the grain side with a mixture of one part paraffin and three parts of cod oil. Oil very lightly all over with a swab. The above will make good collar leather 7 to 8 ounce stock. The sides will average 20 feet. They will have a nice, white, smooth flesh, and are cheaper to finish than hand-stuffed collar leather, and I have tried both ways. Some tanners, after the leather is set, jack the sides on flesh and grain sides. This changes the color to a light russet brown.

I would add that if the tallow you use is poor, help it out by using one part stearine or wax.

If you need more of a russet color, use more acid and borax. The acid must be used until color is russet enough to suit.

ANOTHER RECIPE.

After the leather has been tanned it should be split, to the required substance. Six-ounce collar leather is about the lightest and about 8-ounce is the heaviest required for making horse collars. After splitting and the necessary shaving, mill the leather in borax and water; 15 pounds of borax in water for 100 sides is sufficient. The temperature should be 90 degrees. Then give the sides a milling in sumac liquor, which should be made by boiling four pails of sumac in one-half barrel of water, to which one pound of citric acid has been added. When these materials have dissolved, fill the barrel with cold water, and this will be enough for milling 100 sides at 90 degrees for one-half hour. After sumacing, the sides will have a nice light color, and should then be well scoured on both sides and hung up to dry, if for mill stuffing.

If hand-stuffing is intended, let the stock sammy long enough to set. To hand-stuff, give a light coat of oil on grain, after setting, and a light coat of hand-stuffing on the flesh. After setting, hang up and dry thoroughly, then slick off the flesh side of the skin, and wipe off the grain with a woolen rag. You can brush with a soft brush if preferred, and this is all that is necessary after the stuffing is finished. If the leather is to be mill-stuffed, let it dry out, then dampen down, and let lie covered up in a pile over night. Before stuffing, dampen the flanks and the soft parts with a swab, so that the soft parts will be a little damper than the solid leather, and this will tend to produce a more even color on the stock when finished.

For mill-stuffing use 70 pounds tallow and 20 pounds stearine and 10 pounds merino or any other good make of degras, thus making 100 pounds altogether. Use 20 pounds of this mixture to each 100 pounds of dampened leather. Heat the mill to 135 degrees and make the stuffing 125 degrees heat. Let the mill run 20 minutes with the door on, and 10 minutes with the door out, so that the stock will cool off slowly. Set tight on both sides. Use as little oil as possible while setting. Then hang up. When set, brush the stock on the grain side with a brush broom or by hand. The stock can be rolled lightly on both flesh and grain, or smoothed later. If you have no roller, the leather is just as good without it, only it looks slicker and more attractive.

STUFFING AND STUFFING WHEELS.

For a mill for stuffing grain leather or splits, the following size is desirable and convenient: Diameter, 7 feet 4 inches; width, 3 feet 6 inches. The speed should be from 15 to 19 revolutions per minute. The one important thing in the stuffing mill is a sufficient number of plugs to prevent the stock inside the mill from folding and creasing, especially in milling splits. Splits that are once folded in the milling

will surely show this effect when finished. It is also important, in order to get the best results in stuffing, that the leather be properly dampened by dipping or sprinkling. Leather dipped in warm water should be stacked up over night and well covered. On the following morning pack out straight, and carefully inspect each side, touching all dry and light places with a wet swab. Judgment should be used in seeing that the necks and thin and coarse places are well wet with the swab and warm water.

Next morning take leather from pile as fast as wanted to mill, but keep what is left behind well covered, so it will not dry out. Leather properly dampened, as here directed, will absorb the proper quantity of grease which is necessary to give good weight and fine feel to the leather. The grease will penetrate properly and rapidly and as the dampening, when properly done, has the effect of opening the pores of the leather, neither the grease nor the mill need be as hot as if the leather was too wet and not in proper mellow condition. Expert curriers figure that 30 per cent moisture is enough for grains or splits.

Here are instructions for making a stuffing for grains and splits, which if properly used will give the best of results:

50 lbs. hard grease.
30 lbs. degras.
10 lbs. wax.
10 lbs. No. 4 finishing oil.
Total, 100 lbs.

From 35 to 40 per cent of the above mixture should be given to every hundred pounds of wet leather. Use judgment as to tannage and condition of leather when split. Good authorities state that direct steam or hot air is the only proper way of heating stuffing mills. If direct steam is used, turn out into first mill for ten minutes; have leather all weighed and ready to put in. The grease should be from 125 to 130 degrees hot. The plug hole at bottom of mill should lie directly in center. Drain all water from mill before putting in plug. Now put grease and leather in mill as soon as possible, and run 25 minutes with door in, and 10 minutes with door out. If leather is wet, make the grease hotter; if not so wet, grease need not be so hot.

If convenient, the leather, after milling, should be spread around on floor for ten minutes before being taken to setters.

BEAMHOUSE AND YARD WORK ON COLLAR LEATHER.

In the beamhouse, soak stock three to five days, according to water and weather. After fleshing, put them in the limes, using 7 per cent lime. Lime six days, using as little heat as possible, not over 80 degrees at any time, and then it would only be necessary to steam at

least twice a week, say about the middle of the week and possibly the day before they are unhaired.

Where you use the sulphide of sodium system, you lime only four days and use about 3½ per cent lime in connection with the sulphide.

Keep your bates clean and sweet, making them up at least once a week and use a little molasses in the bates.

When you get your stock in the yard, hang or tack on sticks to suspend in the liquors. Where you hang from six to seven days, the sides or hides will want at least three liquors in that time, ranging in strength, four days for the first, some six days for the second, and about eight or nine days for the third liquor. When you take them off the sticks and handle them, they would want at least two good bark liquors either of about 12 to 14 degrees, and then lay them away in about 15 to 16 degrees liquor. Let them lie as long as you can, or as long as your liquor will hold out. On the press system, you would hang at least 15 to 20 days, and they would get the same amount of liquor as they would if you ran the other way.

THE PRESS SYSTEM.

Many tanners use the press system and never take the stock off until it is ready split. In this system, instead of changing the stock from vat to vat, you keep it in the same vat all the time and change the liquor each day five per cent, so practically the pack gets a fresh liquor each day. The head pack of course gets the strong liquor, and it is pressed through day by day. If you take a barometer and weigh the liquor in the hangers, you would keep more accurate track of the work.

Some tanners hang for about six or seven days and then handle the leather out and give the strong liquors there, but the labor costs more, and I do not think the results are as good. Stock is not as well handled by using the press system and keeping them on the hooks until ready to split. After being split, if they show green, put them back in the liquor for a few days.

Now, when your stock is ready to split, take off the hooks and press and mill to get the wrinkles all out; skive on your belt knife and then split on the same. Before splitting it is a good plan to put the sides through a stoning jack or, what is better, to put them through a good setting machine to get out all the stretch and then split them, 6½ to 7 ounces by the gauge. Then level with shaving machine and if they are tanned, you can put them through.

After being shaved, clear them up, using a quart of oil of vitriol to a barrel of cold water, and mill in this for five to ten minutes and then wash with cold water. Scour and dry up and use a hundred pounds of dry leather. Damp down over night, using 80 per cent of water, and give three gallons of grease, half tallow and half stearine.

Some stock may carry more than this, some less; a man must be guided entirely by what his stock will take. Have your grease along 130 to 140 degrees heat and the heat of the mill the same. Run for half an hour. Take out and set them out good on both sides and oil light on the butts.

ANOTHER METHOD.

Now another system on this: Some take the sides after they are cleared up and then press them just the same as for the skiving and splitting and after pressed, mill up and send to the stuffing mill, and when they do this, use only 180 pounds of pressed weight and the same grease as you would use for the 100 pounds of dry leather. Then hang up and dry out. Have your drying room cool and dark. Keep the sun and hot air out and your stock will dry out a fair color and be softer on the grain. Do not force your drying; if you do, the leather will lose in color. When your stock is dry, pack down for a few days, then take and glass them out by the machine on the flesh side, and then sort and put up in rolls.

TO MAKE GOOD CHROME TANNED HARNESS LEATHER.

Harness leather tanners in this country are very slow in taking up the manufacture of chrome harness leather. In Europe the tanners are making a very satisfactory article.

It is impossible to make heavy harness leather from spready hides. Cutters of chrome harness will insist on having chrome leather as heavy as vegetable tanned, until they learn that chrome is so much stronger than vegetable tanned that it does not require as heavy leather to give the same strength.

In order to get heavy leather it is necessary to have heavy hides, as there is no known way of plumping chrome tanned leather. Therefore, the beamhouse system must be such that it will not deplete the hides. A great many tanners think it is necessary to lime the hides high so as to open them up. They are right for vegetable tanned leather, but not for chrome, as the pickle will open up the hide and put it into proper condition for tanning.

To make good harness leather by the chrome process, the tanner must start by getting good, plump hides. Trim them close in the beamhouse and start working in clean, cold water. (If well water is to be had, it is better to use it in the soaks, as it is even in temperature and will give more uniform results than city or brook water.) Hang the hides in the soaks and you will obtain better results than if the hides are thrown in the water. After they have been hanging in the soaks 24 hours, take them out and mill them for 15 minutes, then

hang back in the same soak another 24 hours. Take them out and split them into sides and flesh clean either by hand or machine. After fleshing, put into another soak of clean cold water for 24 hours. They are then ready to be toggled together and started in the limes.

LIMING.

Have a string of five pits. In the first pit, which we will call No. 1, make up a lime liquor, using 2 pounds of lime for each 100 pounds of hides, green salted weight. Use just enough water to cover the hides. Place the hides in pit No. 1 and allow to remain 24 hours. Make up a lime liquor in pit No. 2, using 2 pounds of lime and 1½ pounds sulphide of soda. Slake the lime, then dissolve the sulphide in the water and mixed well with the slaked lime.

Put the lime and sulphide liquor into the required amount of water in pit No. 2 and plunge them well, then reel the hides from pit No. 1 into pit No. 2 and allow them to remain 24 hours.

Now make up a lime liquor in pit No. 3, using the same amount of lime and sulphide that was used in pit No. 2. Reel the hides from No. 2 into No. 3, and allow to lie 24 hours, then make a lime liquor up into pit No. 4, using 3 pounds of lime, and reel hides into No. 4 and allow to remain 24 hours. In pit No. 5 put warm water, 85 to 90 degrees temperature. Reel the hides from pit No. 4 into the warm water and allow to stay 3 to 4 hours. They will then be ready to unhair, which can be done very readily on a machine.

CLEANING THE LIMES.

In running this beamhouse system the limes must be cleaned as follows: Pit No. 1 is cleaned every 14 days; pits No. 2 and No. 3 are cleaned every 10 days, but do not clean 2 or 3 on the same day; pit No. 4 is cleaned every 7 days. This way will give you an old lime to start with and a new one to unhair out of, which will leave the hides in nice, plump condition.

In reeling the hides into the different pits, care should be taken to place them in the pits so they will be spread out as much as possible, which will insure much more uniform results than if they were put in the pits in bunches. After the hides are unhaired they should be washed in a wash wheel with warm running water for 15 minutes. They are then worked over the beam by hand on the grain so as to remove the gurry from grain. This working the grain by hand will insure a clean, elastic grain that will not crack.

BATING.

After they are worked over the beam they are ready for the bating, which is done as follows: Have a clean paddle tub and fill it with

the required amount of water and warm to 90 degrees temperature. Then for every 100 pounds of hides put into the tub of warm water a quart of lactic acid, 18 degrees. Put in the hides and run the paddle for an hour, and allow the hides to remain in the bating liquor over night. In the morning run the paddle for half an hour and take out the hides and wash in a wash wheel with running cold water 10 to 15 minutes. They are then ready to be pickled.

PICKLING.

The pickling can be done in a pit or paddle tub. If it is done in a paddle tub it is necessary to learn just how much water the tub holds when it is filled up to the first paddle. Then for every 100 gallons of water in the tub dissolve 45 to 50 pounds of common salt. Get the weight of the hides as they are washed from the bate, and for each 100 pounds of hides put into tub of salt water, 1¼ pounds of sulphuric acid and 8 pounds of common salt.

Plunge up the pickle liquor well and put in the hides. Run the paddle an hour and allow it to rest two hours. Then run it half an hour and allow them to remain in the liquor over night. In the morning horse them up smooth to press, and drain 24 hours. They are then ready to tan.

TANNING.

The tanning is done in either pits or rocker vats. This way of tanning will insure full flanks and bellies and also give the leather a fine, smooth grain. Get the measurements of the vats and learn just how many gallons they hold when full of liquor. If tanning in rockers, four will be required; if tanning in pits, it is necessary to have a row of six pits. In making up the liquors in pits or rockers you must dissolve 40 pounds of salt for each 100 gallons of water in the pits, then weigh the pickled hides that have drained 24 hours, and for each 100 pounds of hides add 8 pounds more of salt to the pits. Now take 16 pounds of concentrated chrome liquor to each 100 pounds of pickled hides and dissolve it in 7 to 10 gallons of hot water. Now tack the pickled hides on sticks and hang into the salt water, and if they are put into pits, allow them to hang 6 hours. If they are put into rockers allow them to rock 3 to 4 hours, then put into the salt liquor one-quarter of the chrome liquor and stir well and allow them to hang 24 hours. Keep the rocker going 4 hours after putting in the liquor.

Into pit or rocker No. 2 put another one-quarter of the tanning liquor, and after the hides have been in the first rocker 24 hours change them into the second rocker. If pits are used, allow them to hang in pit No. 1 for 48 hours, then change them into pit No. 2. After they have been in pit No. 2 for 24 hours, add to the pit another one-quarter of the tanning liquor and allow them to remain 24 hours longer in the

rockers and 48 hours in the pit. Then add to pit No. 3 the last one-quarter of tan liquor and change the hides into them. Now take 16 pounds more of the concentrated tan liquor to each 100 pounds of hide and dissolve it in 7 to 10 gallons of hot water and add one-quarter of the tanning solution to pit No. 3 and allow hides to hang 48 hours, if pits are still used, and 24 hours if rockers are used. Now add to pit No. 4 another one-quarter of the tanning solution and put in the hides. After they have been in pit No. 4 24 hours add the remainder of the tanning liquor and allow hides to remain in until thoroughly tanned, which can be tested by cutting a piece from the thickest part of the hide and placing it in boiling water. If it curls up the hides are not tanned. If they do not draw or curl they are tanned and should be taken out and piled down smooth 48 hours. Ten packs of hides can be tanned in these liquors before they are run off and fresh liquors made.

For the second pack use 14 pounds of concentrated tan liquor, and for the other 8 packs use 12 pounds to each 100 pounds of pickled hides. Be sure and always use the required amount of salt in making up fresh liquors. On all packs after the first pack use 5 pounds of salt to each 100 pounds of hide when starting them in the tanning liquor.

After the hides have been piled down 48 hours from the tanning they are put into a tight drum with a solution of borax made up as follows: For each 100 pounds of hide use 2 pounds of borax dissolved in 15 gallons of warm water 90 degrees. Run the leather in this borax solution half an hour, then put the leather in a wash wheel with running water and wash for one hour. The leather is then given a re-tanning of gambier, using 4 pounds of gambier to each 100 pounds of leather. Dissolve the gambier in hot water and then cool down with cold water so as to make 15 gallons to each 100 pounds of leather. Run the leather in this gambier liquor an hour, when it is taken out and either put through a wringer or pressed for shaving. If it is pressed, take it from the press and put into a dry mill and mill for 20 minutes to remove the press marks. All the shaving that is required is to remove the flesh from the back. After shaving hang the leather up to sammy for stuffing. Care must be taken to get the leather into proper condition to take the stuffing. Hang the leather up by tacking the backs on to sticks, as the bellies and flanks will have more moisture in them than the body part of the side. The leather should be almost dry before it is stuffed.

STUFFING.

The stuffing is made up of the best No. 1 stearine, hard tallow and hard wax, as follows: 60 per cent stearine, 20 per cent tallow and 20 per cent wax. Heat the stuffing to 185 degrees Fahr., and give the

leather 24 per cent of the stuffing. Weigh the leather, as it is ready to go into the mill. If the flanks are dry, dampen them a little. Heat the mill hot and put in the leather and run mill 10 minutes to allow the leather to get warm. Then add the stuffing and run the mill 45 minutes. Take out the stock and pile down over night. The next day set out on flesh and grain and hang up to dry. When partly dry, reset on grain side and hang up until dry. When the stock is dry the scratches and imperfections can be buffed from the grain and the leather is ready to black.

BLACKING.

To black, dissolve 4 pounds of logwood crystals in 20 gallons of water and add a pint of ammonia. Now make up a sig by dissolving 12 ounces of carbonate of potash in 3 gallons of water. Place the side on the blacking table and give it a good coat of the sig by rubbing it in with a stiff brush. Then take another brush and rub in a good coat of the logwood. Now give a coat of striker by dissolving 12 ounces of copperas and 2 ounces of bluestone in 12 gallons of water. After the striker is well rubbed in, wash it off with clean water and slick off the grain. Then give another coat of logwood and striker and wash and slick off same as first time. Hang the leather up to dry. When dry, finish with a mutton tallow finish, same as vegetable tanned leather.

ENGLISH METHOD OF MAKING CHROME-TANNED HARNESS LEATHER.

Several English tanners use the following method of making chrome-tanned harness leather, which is said to nearly approximate bark-tanned leather in weight, plumpness and appearance.

SOAKING, LIMING AND BATING.

Soak hides in the usual manner two to three days and give short, strong liming of four days. After liming, soak in fresh warm water 90 degrees F. over night and next day unhair. Wash in drum after unhairing and place in paddle wheel and wash out grain with 25 pounds muriatic acid to each 100 sides in paddle wheel of cold water.

Next transfer stock to bate wheel and bate in medium strength bate (using pigeon dung) at about 75 degrees F. until the center part of a piece of hides cut from the throat shows no color with phenolphthalein. Usually about five hours' paddling is sufficient. After bating stock is thoroughly washed in a drum wheel with cold water and is then ready for the tanning process.

First Bath.—Dissolve 187 pounds common salt in tub of water

and add 31 pounds 66 degree Be sulphuric acid; add sufficient water to make the mixture weigh 8 degrees Be. Place twenty-five sides in closed drum and let run, adding one-tenth (1-10) of mixture each hour for ten hours. Take hides out and let drain over night.

Second Bath.—Dissolve 22 pounds bichromate of potash in five or six gallons of water and add 44 pounds 22 degree muriatic acid. Reduce this mixture to 8 degrees Be with water. Place about twenty-five sides in closed drum and let run. Add a few pails of mixture at the outset and add one pail each hour until all used. Drum in this solution seven hours. Let sides drain over night.

Third Bath.—Dissolve forty pounds hypo in water and add five gallons 66 degree sulphuric acid, make up with water until solution weighs 20 degrees Be.

Drum sides in this solution for two or more hours or until thoroughly reduced.

Wash stock well with water and again with water containing small amount of borax and finally with pure water.

Stock is now ready to press and stuff, after which it is set out tacked (not too tightly), blacked and finished.

ANOTHER WAY OF MAKING CHROME HARNESS LEATHER.

To make chrome-tanned harness leather it is best to start in the hidehouse and pick out good plump hides from 60 to 80 pounds. Trim off the shanks at the knees. Start soaking in clean, soft water. If the water is hard add 5 lbs. of borax to each 1,000 gallons, soak 24 hours and split into sides; then put back into same, soak and allow to stay 24 hours. They are then ready to flesh. After fleshing put into clean, cold water over night, and they are ready for the limes. Use 8 per cent lime and 3 per cent of sulphide of sodium, as follows:

For the first pit put in 2 per cent of slaked lime and allow hides to remain 24 hours.

Make up the second pit using 2 per cent lime, 1½ per cent sulphide, hair hides toggled together so as to reel from pit to pit. Reel from first pit into second and allow to remain 24 hours.

Now make up third pit same as second pit, using 2 per cent lime, 1½ per cent sulphide. Reel from second into third pit and allow to remain 24 hours.

Then make up fourth pit, using 2 per cent of lime. Reel from No. 3 into No. 4 and allow to remain 24 hours.

Now fill the fifth pit with clean water and warm to 90 degrees. Reel from No. 4 into No. 5 and allow to remain 3 to 4 hours. They are then ready to unhair on unhairing machine. After unhairing, wash in wash wheel and wash with running water for 15 minutes and place into pit of clean, warm water, 90 degrees. Allow to remain

in warm water 2 hours and then work over beam to remove fine hair and scud from the grain.

BATING.

They are now ready for the bate, which is done as follows: Have a paddle wheel with a box ten inches square in the front corner. The box must be long enough to reach to the bottom of paddle tub. Have one inch holes, 8 inches apart in the sides of the box. Now put a one-inch steam pipe about half way to the bottom of the box. This is to warm bating liquor while hides are running. In the meantime take a clean barrel and put in 25 gallons of water, 130 degrees. Then stir in two bushels of good dry hen manure and cover with a bag so as to retain the heat. Allow the manure to soak 36 hours and it will be ready to use. Then make a frame 6 inches deep, 15 inches wide and as long as the paddle tub is wide. Put a piece of wire netting quarter inch mesh on one side of frame to make a strainer. Put this strainer over the paddle tub and for the first pack to be bated use two bushels of manure for 150 sides. Strain the manure into paddle so as to keep out all foreign matter. Put in the hides and run paddle one hour; then allow to remain still 2 hours, and then run half an hour and stop half an hour, and run 15 minutes. The hides should now be bated, but if they are not, turn on steam and warm to 90 degrees, and run until they are bated. The judgment of the operator must determine when they are ready to take out. After they are bated wash 10 minutes in wash wheel and put into a cold lactic acid bath over night, using 1 pound of lactic acid to each 100 pounds of hide, hidehouse weight. They are then ready to pickle. Any kind of a good bacterial bate can be used. There are good commercial bates on the market that give perfect satisfaction and are much more uniform and clean than chicken manure. The manufacturers of these commercial bacterial bates furnish directions how to use them.

PICKLING.

To pickle use a pickling wheel, and for each 100 gallons of water in the paddle tub dissolve 30 pounds of common salt. Then for each 100 pounds of hides weighed from the bate use 15 pounds of salt and 1½ pounds of sulphuric acid. Dissolve the salt in a barrel and add the acid. (The 30 pounds of salt to each 100 gallons of water is used when starting the pickle for the first pack only. All packs following the first pack use 15 pounds of salt and 1½ pounds of acid to each 100 pounds of hide.)

Start hides in pickle in morning and run the paddle for 2 hours, then allow it to rest until 1 hour before stopping for the night, then run the paddle 1 hour and allow the hides to rest in pickle liquor until morning, when they are taken out and piled down smooth in some

clean place where no water or bark liquor can get on them, allow them to remain in the pile 24 hours, when they will be ready for tanning. The tanning should be done in rocker vats, but can be done in ordinary vats. Be sure that the vats are perfectly clean from all vegetable tanning liquors.

THE BEST WAY TO CLEAN A VAT

that has been used for bark liquors is to fill up with warm water and dissolve 50 pounds of sal soda into it and allow it to lay in 24 hours, then run off and fill vat with clean, cold water; then put 50 to 75 pounds of sulphuric acid in the water. Plunge well and allow to stay 24 hours. This way of cleaning will remove all traces of vegetable tannic acid, which must be done to get good results.

Now run off the acid water and for every 100 gallons of water in vat put in 35 pounds of salt and plunge well so as to have it all dissolved. Now for each 100 pounds of hides weighed after they are piled down 24 hours add to the pit 1 gallon of our bath tan liquor, 25 degrees Baumé, hang in the hides and be sure there is liquor enough to cover them. Do not crowd too many sides into a vat. For a vat 6 feet wide 50 sides is enough to put in. Start the rocker and let them rock 6 hours, then put in one more gallon of the tan liquor and rock one hour more; now allow them to remain still until the next day, when one gallon more of the tan liquor is put in and run the rocker same as on first day 6 hours; then put in one gallon more of tan liquor and rock one hour. Allow to rest until the next morning, being the third day, then add one gallon more of tan liquor, making 5 gallons in all. Rock hides 5 hours. Now dissolve 4 ounces of borax to each 100 pounds of hides and add to the tanning liquor. Run rocker 1 hour and allow to rest until the next morning. The fourth, fifth, sixth and seventh days rock the hides 2 hours in morning and 2 hours in afternoon. They should be tanned in 7 days, but be sure they are tanned before taking out.

TO TEST FOR TANNING

cut a piece from the under part of neck and one from the butt and put in boiling water for 10 minutes. If they do not curl they are tanned, but if they curl up they must be kept in the liquor until they stand the boiling water. When they are tanned they must be piled down in smooth piles 48 hours, when they will be ready to wash.

To wash put into a tight mill with 15 gallons of warm water, 80 degrees, into which have been dissolved 1 pound of borax for each 100 pounds of leather. Weighed after laying 48 hours from the tan liquor, run them in this borax water half an hour, then place them in a wash mill and wash with running cold water 1 hour. There must be a generous supply of running water in the mill. After washing

they are put into a mill and given a retan, using 1 to 2 pounds solid quebracho to the side, according to the size. Dissolve the quebracho by boiling, then cool down and have about 15 to 20 gallons of the liquor to each 100 pounds of leather. Run them in this liquor 1 hour and pile down over night.

BLACKING.

They are then blacked on the grain on a table as follows: Dissolve 6 pounds of logwood crystals in 50 gallons of water and add 2 pounds of borax. Put a side on the table and slick it out smooth, then give a coat of the logwood liquor, and then a coat of striker made by dissolving 7 pounds of copperas, 5 pounds of bluestone in 50 gallons of water. After giving the striker wash off with cold water and go over the side with the slicker. Then give another coat of logwood liquor and follow it with the striker. Then wash off the striker good and the leather is ready to run through a wringer to remove the water and put the leather into condition for stuffing.

STUFFING.

Weigh the leather after wringing and for each 100 lbs. make up a stuffing as follows: 10 lbs. of good hard wax, 10 lbs. of No. 1 stearine and 5 lbs. good hard grease. Heat stuffing to 190 Fahr. heat. Mill good and hot. Put in the leather and run 5 minutes, then put in stuffing and run mill 30 minutes. Take out the leather and pile down well covered until the next day, when it is ready to set. In setting strike out on flesh side with slicker, hang up until part dry, then stone out the grain good and hard. Hang up until part dry, then reset on the grain. Spread a little cod oil on the grain and go over it again with the stone and finish up with a slicker. Hang up until perfectly dry, then take down and give a good coat of dubbin made of 3 lbs. of mutton tallow, 2 lbs. of cod oil melted together. Glass in the dubbin good and hard and pile down 24 hours. Then re-glass and the leather is finished. The harness maker will have a difficult job blacking the edges of chrome harness leather with the same blacking he uses on bark-tanned harness leather, but he can black the edges of chrome with the following blacking: 8 lbs. logwood crystals, 5 lbs. nigrosine, 6 lbs. sal soda, dissolved by boiling in 35 gallons of water. When thoroughly dissolved, allow to stand until cold. Then dissolve 6 oz. bluestone, 4 oz. bichromate of potash in 3 gallons water, and all to stand until cold. Then add the bluestone and chrome liquor to the logwood liquor very slowly, stirring all the time. After it is all mixed well fill up barrel to make 50 gallons and add 2 quarts of strong ammonia, and stir again. Keep the barrel well covered.

STUFFING LEATHER.

Of the terms used in connection with the manufacture of leather I wonder if there be one more expressive, more "pat," than the word "stuffing," says an experienced tanner. Anyone from a schoolboy to a priest—it is with malice and forethought I mention schoolboy and priest—has a very good idea of what is meant when we talk about stuffing anything.

This is not the case in regard to all terms used in connection with the manufacture of leather. Take, for instance, the word "tanning"; if we mention this word in the presence of the schoolboy he straightway connects it in some way with hickory rods or shingles or birch switches or something of that sort; let us mention the same word in the presence of the boy's big sister and she will think neither of shingles nor of switches, but perhaps of the seashore or of the mountains. Some of the terms which we use could conjure no picture before the mental vision of anyone—priest or small boy—saint or sinner—but "stuffing," we all know what that means; and it means just the same when used in connection with the word leather that it does when used in connection with anything else.

PREPARATIONS FOR STUFFING.

Most things need no special preparation preliminary to stuffing; with leather, however, this is not the case, its preparation for stuffing being an important feature. Notwithstanding its importance, however, there is considerable difference of opinion among curriers in regard to the best manner in which this may be accomplished.

There is also much difference of opinion in regard to the manner of stuffing and the materials to be used for the purpose. Some stuffers will tell you that success or failure depends more upon the manner in which the materials are mixed than upon the materials themselves, while others will tell you that no skill in mixing can make up for poor oils or greases. It is well to bear in mind that the kind of stuffing to use depends on the class of goods to be made and the tannage of the leather.

COST OF OILS AND GREASES.

There is also another important thing to be taken into consideration, and that is the cost of the different oils and greases. In considering the matter, however, it is always well to bear in mind that first cost is relative. There are oils and greases which would be expensive even if they were given to the tanner. Many a fine lot of leather has been damaged beyond repair by cheap stuffing materials. In these days whatever else a manufacturer may leave to the skill,

or lack of skill, of a bungler he is careful that no bungler has any hand in preparing adulterated goods. For this reason, unless one employs a chemist, it is usually impossible to detect adulterants, and it is therefore unwise when you have found a good oil and a dealer whose word can be depended upon to change because someone offers you something a trifle cheaper.

When results are taken into consideration—permanent strength, body, mellowness and elasticity—one cannot get anything much cheaper than good cod oil. Menhaden, an oil obtained from the herring, is probably one of the most common adulterants of cod oil, but, if one must use menhaden oil, he would much better buy it himself, as menhaden, and do his own mixing. Menhaden is bought in this way and mixed with paraffine oil. In addition to the fish oils—oils obtained from the body of certain fish instead of from the livers—rosin, mineral oil, water and gelatine are used as adulterants in cod oil.

Most fish oils impart mildness and elasticity to leather, but all fish oils do not produce permanent results and most of them "spew."

Mineral oils produce neither mildness nor elasticity, but in some cases, in combination with other oils or greases, they prevent gumming and spewing. The wool fats in certain combinations also prevent spewing and they give a bright, live look to the leather.

Probably nothing better can be used for stuffing leather than good degras, but it must be borne in mind that there is a great variation in commercial degras. Some of it contains inferior wool greases and mineral oils of low value. It may also contain iron salts, which are capable of causing much mischief in the way of dark spots and an off color in the leather.

To insure good results in stuffing leather not only must a good quality of grease or oil be used, but the goods must be properly looked after, both before and after stuffing. In the days of general hand stuffing scouring was an important feature of the work, but it is now usually omitted, the goods being dried out directly from the tanning liquor and after drying dampened and left in piles over night to sammy. The room in which the leather is left to sammy should be kept at an even temperature.

LEATHER SHOULD BE EXAMINED CAREFULLY.

Before placing the leather in the drum it should be examined to see that all parts have become thoroughly dampened, but it must be borne in mind that if the leather is excessively damp it must remain in the drum longer than leather which is just right. This must be determined by experience. The drum should be dry and of just the right temperature. If it be heated to about 150 degrees Fahrenheit it will be found to be about 140 after the grease and the leather have been added. Too high a degree of heat or too dry a heat will cause

the leather to shrink and to be harsh; a dry, live steam will usually give best results.

The goods should be run in the drum thirty minutes with the door on; at the end of this period the door should be replaced by a grating and the drum run for about fifteen minutes longer to cool the leather.

SPEWING OF LEATHER.

One of the most frequent defects to which mill stuffed leather is liable is "spewing." In some cases it looks like white mould, which can be wiped off, but will nearly always return. The cause of this is sometimes from slight mildew on the dampened leather, which may have lain too long in piles before stuffing.

Something which much resembles the above in appearance is caused by the alum, acid or other matters used in pickling, and is very noticeable in splits taken from combination leather, and from sides designed for chrome purposes and which have been pickled before splitting. Again, spewing may be caused by the use of adulterated oils, and it is well known that certain low grade oils will always produce it.

The water which is required for satisfactory wheel stuffing may in some cases be introduced into the stuffing grease as well as into the leather. This is the reason that a percentage of degras and sod oil are beneficial in wheel stuffing, as with both of these a certain amount of water is thoroughly incorporated.

The good effects produced in stuffing by the addition of degras and sod oil to the hard grease in the kettle is sometimes lost by heating the mass to too high a temperature, which drives off the water which both of these contain, and thus much of their virtue is lost to the leather. Better to melt the stearine and hard grease first, shut off steam, and then add the sod oil and degras. These should not be subjected to a higher temperature than 150 degrees Fahrenheit—nor will it be necessary, as the addition of these to the hard grease in the kettle will bring down the melting point of the entire mass.

HARNESS LEATHER TROUBLES.

During some seasons of the year harness leather tanners have trouble with their stock, which gets mouldy while drying, or white scum appears. Most of these difficulties arise through lack of foresight, otherwise they would occur in the hot weather as well as in damp or cold weather. Some tanners never think of maintaining summer heat in the shop until forced to incur the expense of refinishing a lot of stock. Where harness leather is mill stuffed, the heat of

the shop should be as near alike winter and summer as possible, as one of the causes of mouldy stock is due to stock being allowed to chill at night in cold or damp weather after a certain amount of heat in the day. In cold weather leather is sometimes taken down as dry when it is cold, and piled for a few days. When handled for further operations mouldy sides are found.

The heat of the shop during the day takes the chill from the stock, which in a pile turns to dampness, and the result is mouldy spots. Then the blackers start their day's work on cold leather, and the logwood won't take as it should. The operator knows where the soda or whatever alkali is used is kept, and uses an extra dose to help out. This in cold weather causes white scum oftener than anything else.

These incidents are more noticeable in small shops than in large ones, yet with a little care and forethought they can be avoided to a great extent. Keep the heat of the shop as nearly uniform day and night as possible. As soon as the weather gets a little cool, see that all broken windows are repaired, and whatever ventilation you need have it through the roof, where it will carry off the dampness, then many of the cold or damp weather difficulties will be overcome.

BLACKING FOR HARNESS LEATHER.

One barrel of japonica (gambier) liquor, showing 10 degrees test by the barometer. To this add 15 pounds of ferrous sulphate (copperas); 2 pounds epsom salts and 4 ounces of powdered nutgalls. Dissolve the copperas and nutgalls in one pail of hot water first, then add the japonica liquor.

Quebracho-tanned leather is very hard to black; pretty near as bad as chrome tannage.

EDGE BLACK FOR HARNESS.

Alcohol	1	pint
Tincture iron	1½	oz.
Ext. logwood	1¼	oz.
Nutgalls, ground	1	oz.

Put the alcohol in a bottle of suitable size, add the other ingredients, cork bottle and let stand twenty-four hours, shaking the bottle several times during the period; then add one pint of soft water.

TO EXTRACT GREASE FROM HARNESS LEATHER.

There is no practical way of taking grease out of harness leather. Curriers sometimes overstuff a batch, and no attempt is made to extract some of the grease from the leather, other than what works out in the

ordinary processes. But care is taken in the succeeding processes that little grease is used.

Benzine would remove grease. Soaking the leather in water heated to 135 degrees, then slicked on flesh and grain as soon as it is taken out of the water, would remove some of the grease. But neither of these ways is feasible, for the hard grease that is forced into harness leather in these days by the aid of heat will not yield readily to treatment.

Harness leather for loops should be well filled in the tanning and stuffed by hand. Loops made of such leather will take a good impression and the impression will last as long as the harness. Of course, it requires more power to make an impression on such leather than on most of the harness leather on the market.

Instead of trying to take grease out of harness leather it would be more in unison with the fitness of things to make arrangements with some reputable manufacturer for a supply of well-tanned leather.

ANOTHER COLLAR LEATHER PROCESS.

Large spread, thin hides of coarse texture are suitable for collar leather. Such hides puzzle the small tanner to know what to make of them so as to reap the best harvest. He knows by experience bought with a price that if he manufactures them into shoe leather he can sell the leather only at a sacrifice.

There are hundreds of small tanneries located here and there on this continent and there are probably three small harness makers for every tanner. The small harness maker in supplying the wants of his customers uses more or less collar leather, and would rather have the leather of the small tanner at home than of the large manufacturer in some distant city or town. And he is right, for no man who has the welfare of his town at heart would send his money outside when just as good an article can be bought in his own town for the same money.

HAND MADE HIDES FOR COLLAR LEATHER.

We purpose telling the small tanner how to manufacture a superior class of hides by hand into a collar leather that will rank with the product, from the same class of hide, of the largest and best equipped tanneries on the continent.

Take fifty green salted hides of the kinds stated in the foregoing introductory. Open them out, being particular to see that no parts are folded, and throw them into a soak of clean, cold water, flesh down. Let them remain in the soak over night. In the morning handle them from the soak. Run the water out of the soak and fill it with fresh water. Split the hides along the ridge from butt to head, being careful to keep to the line, for bad splitting is not a characteristic

of an ideal side of collar leather. When splitting, fold the sides at the center of their lengths, flesh in, and throw them flatly on the beamhouse floor one upon another. Once a pack is split never throw the sides on the floor in a confused mass. Having split the hides, flesh the pack closely and cleanly, being careful not to cut into the hide proper. As each side is fleshed throw it into the soak. Let them remain in the soak over night. Handle them in the morning and to press out more or less salt water let them remain up an hour or so. Run the soak off and fill it with fresh water; put in the pack and handle it again in the afternoon about quitting time; change the water; put the pack back into the water and next morning it is ready for the lime.

LIMING.

Clean an ordinary lime vat and run sufficient clean water into it. Take one peck of fresh burned lime and slake it in a barrel. As soon as the lime is slaked pour a few pails of water into the barrel and stir briskly, then pour the lime into the vat, being careful not to let any dregs go in. Plunge the lime well and it is ready for use.

Handle the pack from the soak and either put the sides into the lime singly or fasten them together in a continuous line. When putting the pack into the lime care should be taken to spread each side out well on the surface of the lime, flesh side down, so that every part of the flesh gets a light coat of lime powder.

Handle the pack twice daily for three days, and afterwards once daily while it is in the lime, giving it one gallon of lime daily until the hair starts.

When the pack is put in the lime, dissolve in a suitable vessel four pounds of sulphide of sodium in three gallons of water, by the aid of steam or otherwise. On the morning of the third day the hides are in the lime put one gallon of the sodium solution into the lime and plunge the lime thoroughly. Next morning put in the second gallon of the solution and the following morning the third gallon.

A good way to put the sodium solution into the lime vat is after slaking a gallon of lime in the barrel and pouring sufficient water in, then pour a gallon of the sodium solution into the barrel; stir well and pour the mixture into the lime over as much of the surface of the lime as possible; plunge thoroughly and put the pack into the lime.

The pack being limed, handle or reel it upon boards which have been placed across the vat containing the pack when handled by hand, and across the adjoining vat—when the pack is reeled. Let it remain on the boards a short time to drain before beginning to unhair it. It is far from pleasant work handling undrained stock on the tanner's beam.

In small tanneries stock is unhaired on the inclined beam with a knife known to the trade as a worker. The edge of the knife should

be dull and smooth. If there is any blemish in the edge, such as a dent or a crack, the grain will be injured.

UNHAIRING.

Usually, when unhairing, the workman places several sides upon the beam at a time. They are placed butt first upon the beam with just enough of the head end hanging over the end of the beam to hold the side in position while it is being unhaired. The unhairing should be well done and the short hairs worked out as thoroughly as possible. As soon as a side is unhaired throw it into a soak of clean water.

FLESHING.

The pack being unhaired, is ready for fleshing, and the work is done on the inclined beam with a knife known to the trade as a flesher. The knife has two edges, one concave and the other convex.

The former is used for scraping and is ground with a narrow bevel on the back side of the edge. It is possible to have the edge too sharp. When the edge is too keen, more or less injury is done to the stock. The latter is used for cutting and is ground with a broad bevel on the back side of the edge. The edge cannot be too keen. Care is taken when using the edge not to cut into the hide proper. All loose flesh is scraped off with the concave edge, and membrane on the butt and other parts broken up. As soon as a side is fleshed throw it into a soak of clean water and it is ready for the bating process.

TO MAKE A BATE.

Run off the old bate and fill the vat within a foot of the top with clean water. Take three pails, one bushel, of properly saved hen or pigeon manure, put it into a clean brood, fill the barrel rather more than half full of water, run a steam pipe into the barrel and heat to the boiling point. Then with a wooden pestle stamp or marsh the manure, finely cover the brood closely and let it stand till the solution begins to work, when it is poured into the bate vat. Plunge the liquor well and let it stand a few hours, then plunge again and put in the pack.

When putting the pack into the bate, spread the sides out well on the surface of the liquor and let them sink of their own accord. Handle it twice daily for three days, then once daily, and do not let it remain long up at a time.

Hides that are limed by the aid of sulphide of sodium in the limes do not take on a rough grain when put into the bate, like hides limed in a new lime without the addition of the sodium. After putting the

pack into the bate it will be noticed that the sides fall away more or less in thickness the first few days, then they begin to rise and become soft, plump and mellow to the touch, and have lost the rigidness caused by the lime, also much of that natural to the hide. At this stage they are ripe for working.

When stock in the bate is fully ripe for being worked one working produces better results than two working do when it is not fully ripe. In fact, to work a bate when it is not in proper condition is injurious to the stock, for it checks the natural action of the bate at an important stage and subjects the grain to too great a strain in getting rid of the rigidity of the stock.

Many tanners, to save the grain, put stock in which the limy rigidness has not been wholly abated into the liquors. Lime causes stock to become more or less rigid and so long as the stock retains that rigidness there is lime present. Astringent vegetable infusions are incompatible with lime; consequently no tanner who puts stock while in a rigid condition into the liquors is famed now or ever has been as a manufacturer of first-class harness or shoe leather.

MORE BARK TO FILL LIMY STOCK.

It takes more bark to strike and fill limy stock than it does to strike and fill stock which has been properly bated. A knowledge of this fact would, if it had due weight, effect the saving of a large quantity of bark yearly to tanners.

In small tanneries a good way to work a bate the first time is on a well jointed table with a scouring stone. The second working should be done on the inclined beam with a knife known to the trade as a "worker."

The bate being ready for working, handle up twenty sides of the pack and let them remain a short time before beginning to work them. Take a side and place it upon the table butt first with part of the head hanging over the edge of the table to hold the side in position. Scour out all yielding matter and short hairs, being careful to stretch the flanks out of shape. So soon as the pack is worked, put it back into the bate to remain over night. Next morning work it on the grain, then on the flesh thoroughly, throwing each side as it is worked into a soak of clean water, from which, so soon as all marks have disappeared from the grain, it is taken to the tan yard.

Small tanners are not skilled in the use of instruments for testing the strength of a liquor. They know a weak liquor and such a liquor is the only kind into which green stock just from the beamhouse can be immersed safely. Toughness of grain is a distinguishing characteristic of a piece of collar leather of the first class, and such a grain can be secured only by the use of weak coloring liquors.

COLORING.

Of the three ways of coloring stock, hanging it in a rack is undoubtedly the best way in many respects. While it is in the rack the liquor is changed daily, the rack is rocked two or three times daily and the pack is kept in the rack till the grain is struck, when it is taken out of the rack and handled in the liquors.

When the pack is half struck on the butts it is skinned, then split to the substance that suits the wants of the trade. After splitting the sides are shaved to level them, then they are put back into the liquor and turned until the flanks acquire considerable firmness. We know that many tanners take collar leather out of the liquors with the flanks and other loose parts not filled and rely on the stuffing wheel and hard greases to give the stock, and especially the loose parts, firmness; but such firmness it not honest and such stock cannot hold its own on the market against stock which has been properly filled in the liquors.

The pack being tanned, handle it on the boards to drain over night; then place it in the currying shop for scouring.

SCOURING BY HAND.

In small tanneries the scouring is done by hand. The work being toilsome, it is as a general thing more or less slightingly done. Few men like the work, especially when the grain is firm. Men do it in a sort of a way, thinking that they will make up for lack of thoroughness by a little extra work in the setting for stuffing. Lack of thoroughness in scouring cannot be remedied in the setting; for the condition of stock when being scoured is quite different from its condition when being stuffed. In the former it is charged with water and in the latter it is sammied.

Having placed several of thes ides in the tub at the end of the table, take a side from the tub and place it upon the table flesh up. Slick and brush the flesh to free it of sediment and raise a nap. Then immerse the side again in the tub and place it upon the table, grain up. Draw the ridge or straight edge of the side close to the edge of the table and fasten the side along the ridge to the table, making the edge straight. Cross scour the side in courses running from the ridge to the belly and beginning the courses at the head and repeating them till the butt is finished. The grain should be scoured thoroughly and made so soft that it will readily take impressions.

Having finished scouring the pack, oil the sides on the grain with pure cod oil and hang them up to sam. So soon as the sides are sammied enough to hold the set, take them down, damp the dry spots properly, fold them grain out, place them in a box and cover closely. Let them remain in the box until they become mellow to the touch.

This mellowness will appear before the sides heat sufficiently to injure them. When mellowness has developed they are ready for being hand-stuffed.

There is no dubbing for stuffing collar leather equal to that made of cod oil and tallow. And such dubbing is not improved by the addition of petroleum oils and waxes. Mineral oils and waxes are a positive injury to leather, for the particles of mineral oils and waxes will not combine with the particles of tanned stock and form new compounds. No one has yet succeeded in making oil dressed buckskin or chamois with mineral oils, simply because the particles of the oil will not combine with the particles of the prepared skin to form chamois. The sole use of petroleum wax in the manufacture of either collar or harness leather is to give the leather a false firmness and a false weight.

To make first-class collar leather the stock must undergo a tanning process after it leaves the liquors. When prepared hide or skin is brought in contact with astringent vegetable infusions, such as oak or hemlock liquor, the particles of the liquor unite with the particles of the prepared skin and form new compounds, or what is known in commerce as rough leather. So it is when rough leather and a proper dubbing are brought in contact, the particles of the former unite with those of the latter and form new compounds, or what is known in commerce as harness leathers.

The proportional quantity of cod oil and of tallow to make dubbing suitable for the season of the year is left to the judgment of the workman. Dubbing should not be so firm as to require great labor in breaking it down, brushing it into the flesh and laying it on according to the requirements of the parts. A dubbing for winter should be richer in oil than one for summer.

To begin work, place a side on the table flesh up and brush the flesh over light with dubbing to stick the side to the table. Then turn the side grain up and rub the grain over with the brush; for a little grease helps the stoning. Bring the ridge of the side nearly to the edge of the table and fasten the side along the .... to the table, making the edge or ridge straight. Now stone the grain of the side over and while doing so work the side into good shape. Keep the hind shank well in, set the front shank straight out; any inclination should be forward. Keep the point of that part of the brisket on the inside of the shank well up to the shank and keep the point of the brisket on the outside of the shank well up to the shank also. Set the part of the brisket on the outside of the shank so as to give the side as great depth across at this point as possible. Aften stoning slick the grain, then oil it. Turn the side flesh up and set it firmly to the table without altering the form given to the side in the stoning. The side is now ready for stuffing.

Dubbing should be rubbed well down into the flesh of stock. The

pores should be well filled with the grease to the exclusion of the air. Unless the pores are well filled with grease the flesh will be wanting in appearance and the leather will lack in weight. The rubbing causes the dubbing to assume a light or cream color and brings it to a state or a consistence which favors the laying of it on with sweeps of the brush according to the requirements of the parts.

The stock having dried in the stuff, take it down and place it spread out in a pile on the floor, grain to grain. In the pile the sides become flat, exhaust the dubbing and become mellow. The longer they remain in a pile the more difficult it is to black the grain. And if they should become heated in the pile it would be a very difficult thing to give the grain a fast black.

To make a good black for collar leather, put 80 pounds of soft water in a suitable vessel, add to the water 2½ pounds of sulphate of iron, copperas, when the iron salt has dissolved add 4 ounces of chromate of potash, yellow, dissolved in a quart of boiling water. When adding the potash solution pour it in slowly and stir well while it is being poured in. The black should be kept in a vessel from which the air is excluded.

This black is a weak one, yet it is strong enough to give a permanet blue black to the grain of leather that is in good condition. It is not strong enough to sink into the grain so as to show when the leather is cut, which is a very important thing in a black when it is known that sulphate of iron is more or less injurious to leather.

The mordant used is logwood, with a little sal soda to draw the color from the logwood and to cut the grease on the leather.

Having blacked a side, give the grain a light coat of thin dubbing and place on a side table or on the floor. Proceed with the work until a number are blacked and placed grain to grain, one upon another in a pile; then upset the pile. Sprinkle the table with water, take a side and place it upon the table, with a pebble stone fasten it along the ridge to the table, stone the grain well. Slick it free of grease and stone mark, glass and give it a light coat of hot tallow; then hang the side up to dry.

After the sides have dried in the black they are taken down and placed on the floor, one upon another, in a pile to remain over night. When the grease is slicked from the flesh care is taken to use a slick that has not a very keen edge. Place a side on the table, grain up, trim it, then slick grain pretty free of grease, brush it well, glass and rub it with a woolen cloth, when it is ready for market.

VALUABLE HINTS ON COLLAR LEATHER.

After the leather is tanned it must be split to the required substance. Six ounces collar leather is about the lightest and about 8 ounces is the heaviest required for this kind of stock. After splitting

and necessary shaving, mill the stock in borax water; 15 pounds borax in water for 100 sides is sufficient. Mill at about 90 degrees heat, then give the sides a milling in sumac. Four pails sumac boiled in half barrel water; add 1 pound citric acid. When dissolved, fill the barrel with cold water. This is for 100 sides. Mill in sumac for one-half hour at 90 degrees heat. This will produce a nice light color. After sumac scour well on both sides and hang up to dry it for mill-stuffing. If hand-stuffing is intended, just let the stock sammy enough to set and hand-stuff. Give light coat of oil on grain after setting, and light coat of hand-stuffing on flesh after setting. Hang up to dry out thoroughly, then slick the flesh side off clean and wipe the grain side off with a woolen rag, or brush with a soft brush, is all that is required, and the stock is finished.

If it is intended to be mill-stuffed, let the stock dry out, then damp down for mill-stuffing. Let it lie in a pile covered over night, then before stuffing damp the flanks and soft parts with a swab, so the soft parts will be a little damper than the solid parts, which will produce a more even color to the stock when finished. For stuffing use 70 pounds tallow, 20 pounds stearin, 10 pounds merino or any good make of degras, 100 pounds in all. Use 20 pounds to each 100 pounds damp leather. Heat the mill to 135 degrees and stuffing at 125 degrees. Let mill run 20 minutes with the door in and 10 minutes with the door out to cool the stock off slowly. Set tight on both sides. Use as little oil as possible while setting. Then hang up to dry. When dry brush the stock on the grain side with the brush wheel or by hand. The stock can be rolled lightly on both flesh and grain with smooth roller. If there is no means of rolling the stock, it is just as good without, only it doesn't look quite so nicely finished.

MAKING SMOOTH GRAIN IN HARNESS LEATHER.

A tanner should know the nature of hides and the effect of material used in the tanning process. For harness we want weight and pliability, yet a certain amount of firmness. To get all these qualities the tanner must know the effect of all material used and when and how to use them. In soaking hides it is necessary to know when they are soaked enough, for in the soaks and limes we lay the foundation for a smooth grain. If hides are not soaked enough and go in the limes hard, the grain will be rigid and hard. Soak the hides until they are soft and pliable, but not flabby, and run down in hide substance. Use plenty of clean water and change it often. Get the hides clean and free from dirt and salt. Flesh them before going to the limes. Put them in a lime not very strong, but strong enough so that in a few hours they will begin to plump and show the effect of the lime. Handle every day and strengthen the limes every day.

Three bushels of good lime ought to lime 100 hides for harness, not counting the lime used in making new limes. From three to five bushels of lime is enough to make new limes. When the hides are limed, which should be in about six days, put them in warm water, from 75 to 85 degrees, then unhair. After unhairing the hides, give ten minutes' tumbling in a good wash wheel. Work by hand or machine, and they will not require much bating. If the stock is kept in warm water and warm bate from the time it comes from the limes until ready for the liquor, it will insure a nice, smooth grain to start in the liquors with.

Cold water will make the grain rough unless the stock is limed very high.

Some tanners think that low bating is necessary to make good pliable leather and that they must use chicken manure, no matter how bad it smells. I maintain that with a good working and plenty of warm water, lactic acid is better than chicken manure. It will neutralize the lime and not reduce the hide in substance and weight, as chicken manure will. The hides must not go to the liquors full of lime if, firm, strong leather is wanted. If lime is left in the leather it will be open and coarse and the grease will run through it in stuffing like water through a sieve. Leather that will not hold grease does not gain in weight in stuffing. Here is the cause of much trouble with mill-stuffing and light weight leathers from hand-stuffing. Get rid of salt and dirt in the soaking and lime in the working and bating, but do not get rid of hide substance. In this way the tanner will have something to work upon when the stock goes to the liquor.

Now come the liquors. This is the time to put back what was taken from the hide in soaking, liming and bating. Tanning takes the place of the gluten or filling of the hide that has been drawn from the hide during the beamhouse work. The best system of applying the liquor to the green stock is by what is known as the overflow system in the handlers or suspending the sides on slats. I will explain this, as I know how many tanners in the West and South think that hides must be worked through the beamhouse and handlers whole, so as to get better shape to the sides. This is a mistake. If hides are split straight and tacked on the slats as they should be they will tan as straight as if they were not split and tacked on. For suspending the sides on slats the vat should be at least 9 feet long, so as not to turn back the heads in tacking on the slats. Spike a plank 2 inches thick on both ends of the vat for the slats to rest on. Have the slats low enough in the vats so that the liquors will cover the slats about 2 inches. There should be five or six vats in a section connected from the strongest to the weakest by boring a 2-inch hole from the first to the second vat and so on to the last or weakest vat.

A box wide enough and long enough to cover and reach from the hole to within about 2 inches of the bottom of the vats should be

placed in the second, third, fourth, fifth and sixth vats. When the liquor is run in the first or strongest vat it will circulate through the whole section and the weak liquors will rise to the top and flow to the weak junk through a hollow plug. The liquor should be run on the strongest vat very slowly, thus giving time for the strong liquor in each vat to settle to the bottom and the weak to rise and flow to the next weaker vat and so on to the weakest vat or green pack and down the overflow plug to the junk. This system of managing green stock in the handlers is not only the cheapest as to labor cost, but is a perfect way of strengthening the handlers. The liquor can be run just as fast or as slow as the young stock requires it. The constant circulation of the liquor tans the stock fast and gives the best flanks and shoulders and a smooth, soft grain, better by far than any other system in use. It is an easy matter to keep the grain smooth when it is once formed in the handlers and tanned enough to go to the stronger liquors.

TO COLOR SKIRTING FOR SADDLES.

FOR RED.

Two and one-half ounces red M.
One ounce chrisodine.

FOR CHERRY.

Two ounces leather red.

FOR ORANGE.

Two and one-half ounces orange No. 2 and
One-half ounce of acetic acid to
Two and one-half gallons warm water.

FOR CHOCOLATE.

Two ounces brown B.
One-half ounce acetic acid.

For a very pretty tan shade, use one and one-half ounces cannelle, No. 1, and one-half ounce brown.

For lemon skirting, use two ounces azoyellow.

For brown, use two ounces leather brown and one-half ounce Bismarck brown.

For a very light tan shade that can be highly polished and made to represent oil skirting, use one-half ounce of Paris brown.

For ox blood or dark red, use:
Two ounces Bismarck brown.
One ounce red.
One-half drachm violet.

FOR BLACK STRAP.

Use two ounces nigrosine B and one-half ounce copperas. Size with the blood finish and glaze with glassing jack.

These colors can all be reduced or strengthened according to the shade wanted. The exact formulas here given are for all sumac bleached hemlock stock. With slight alterations they will meet all requirements for oak-tanned stock as well.

Much care must be used in combining these different shades and applying them to the leather. Any currier, however, by the exercise of judgment, coupled with his experience in handling colors, will succeed with every color.

After these shades and colors have been applied evenly and dried, finish the leather as usual, either by glazing jack or roller; or dry-finish them.

Great care must be exercised in brushing these dyes on evenly so as not to streak or spot. The finishes also must be spread on evenly so as to glaze bright and uniform.

Patent Leather.

CHROME-TANNED PATENT SIDE LEATHER.

Chrome patent side leather is one of the best money makers for the tanner, provided he works it right and keeps it right, says a successful one. There is no reason why the stock should not run uniform after the tanner understands the conditions under which it is made. It is the best money maker for the reason that there is more yield from the hide than in any other chrome leather. Ninety per cent of chrome patent leather is split for light weight stock, which gives a good heavy split, and the lighter grain you have the larger measure you will get. It is a well-known fact that the more substance is put into chrome grain leather, the less measure you get.

GOOD HIDES NECESSARY.

To produce chrome patent side leather successfully, suitable material must be used, not old salt-stained hides, nor hides that have been pickled with saltpeter, or a good, strong grain cannot be obtained. It is not generally known among tanners that hide dealers pickle their hides, but it is a fact that a large number of hide dealers, when getting ready a shipment of hides or resalting hides to hold them for better prices, will give those that do not look fresh a pickle of saltpeter and alum. This will keep the hides looking good until they go into the soaks, and as soon as the saltpeter and alum is soaked out of them they begin to deteriorate and the hair slips before the hides have had half the soaking they require. Such hides will not make good patent leather, although they will work up into box or mat sides and make fairly good stock. They will not make good patent leather, because the grain is tender and cracks easily.

This defect in hides comes only in spots. It is a rare thing to find a hide that is affected all over, and almost impossible to detect an affected hide after unhairing unless it is very bad. I have seen leather made for japanning that had these spots and it sold for 12 cents per foot. The tanner who made the leather was driven almost frantic trying to locate the source of the trouble. The usual explanation is that the spots were lime or sulphide burned, or were acid or alkali

spots. The tanner will frame up all kinds of systems to prevent such things happening, and when he finds he still has the spots he usually gives up making patent leather.

The way to stop this trouble is to purchase No. 1 hides from a reliable dealer, or watch the hides as they come from the soaks. Every hide that has any hair slip spots, punch with a special mark so that when it is unhaired it can be worked up into some kind of leather other than patent.

TRIMMING HIDES FOR SOAKING.

In trimming hides for soaking, do not leave the legs on below the knee joint, for good leather cannot be made from that part of a hide. If it is allowed to stay on the hide and is made into leather, it is either torn off in shaving or staking, or is trimmed off at the sorting table. Such pieces are more profitable in glue stock than in scrap leather.

After the hides have been properly soaked and trimmed, they should be soaked in fresh, clean water for twenty-four hours, then put into a wash mill and washed for fifteen minutes with a generous supply of water to remove all the filth and salt. They are then put into a fresh, clean soak for twenty-four hours longer, when they are ready to flesh. After being fleshed they should be weighed in order to ascertain the proper weight for the materials that are to be used to unhair with.

BEAMHOUSE.

There are two very good systems of beamhouse work for preparing hides for tanning into patent leather. One is the sulphide system, in which the hair is entirely destroyed and there is no danger of fine hair remaining. The other is the lime and sulphide system. I will describe both.

The sulphide system must be manipulated in a paddle wheel, in which it is necessary to have a waterpipe connection so a one and one-half inch stream of water can be turned in the paddle on the front side, and a two inch hole six inches from the top of the paddle at the back of the paddle tub. When the paddle tub is ready, make up a sulphide liquor one degree strong, Baume measure. Make just enough to cover the hides so the paddle will turn them. For every 100 pounds of sulphide used to make up the liquor, slake twenty pounds of lime and add to the liquor. The lime is used to prevent the hides from swelling too fast. When the liquor is ready, put in the hides and allow them to remain for forty-eight hours, running the paddle fifteen minutes every two hours during the day. After they have been in the required length of time, knock out the plug at the bottom of the paddle tub, run the liquor and the dissolved hair off, then fill up the paddle and wash the hides for two hours, keeping the water running

all the time. When the two hours are up, remove the hides from the paddle tub and scud them over the beam by hand. There will be no hair, but there will be a large amount of gurry to remove so as to have a thin, pliable, strong grain. After they have had the scudding, reflesh, then clean on the machine.

They are then put into a closed mill and for each 100 pounds of hide dissolve four pounds of first grade bicarbonate of soda in fifteen gallons of water 75 degrees Fahr., and run the hides in this solution for one-half hour. Now run off the liquor and add a fresh liquor, using the same amount of bicarbonate of soda in fresh water to remove the soda, when they are ready to bate.

BATING.

The bating can be done with manure or a commercial bacterial bate. If a manure bate is used, it must be soaked at least four days in water 90 degrees Fahr., then strained through a fine wire strainer or a burlap bag so as to remove the grit and dirt. Have the bating paddle made with a false end in it, with one-inch holes in the latter and a steampipe bent to fit the curve of the round bottom of the tub, and fit it in the cavity between the false and the true end. Put in the bating material and water and then the hides. About 150 sides are all that should be bated in an ordinary sized tub at one time.

To start a fresh bate it will take two and one-half to three bushels of chicken manure, or the liquor from that amount. After the hides are in, start the paddle and turn on the steam and warm up the liquor and hides to 80 degrees Fahr.—no higher. Run the paddle one-half hour and stop it for one-half hour. Be sure and see that the steam is turned off before stopping the paddle. The length of time required to bate hides that have been worked with the sulphide system will be about two hours, or half the time it takes to bate hides unhaired with lime. In bating hides for patent leather, the temperature should be low, and they should be given plenty of time and room.

TO WORK THE LIME SYSTEM,

it is necessary to have a string of five pits, and after the hides have been fleshed from the soaks make up a lime in pit No. 1, using 1½ per cent of lime to the weight of the hide after fleshing. Allow the hides to remain in the lime twenty-four hours, then in pit No. 2 make up a lime using 1½ per cent of lime and 1 per cent of single strength sulphide. To dissolve the sulphide right, put the lime in the lime tub and put in the dry sulphide, then the water, and allow the lime to slake and dissolve the sulphide at the same time. In this way you get a perfect infusion of the lime and sulphide, which can be obtained in no other way.

After the hides have been in the first pit twenty-four hours, run them into pit No. 2. Make up in pit No. 3 a lime solution, using the same amount of materials as in pit No. 2. When the hides have been in pit No. 2 for twenty-four hours, reel the hides into pit No. 3. Make up a lime in pit No. 4, using 2 per cent of lime only, and reel the hides into No. 4 after they have been in No. 3 for twenty-four hours. Allow them to stay in No. 4 twenty-four hours longer, then fill up pit No. 5 with clean, warm water 80 degrees Fahr., and reel the hides into it and allow them to remain three hours, when they are ready to unhair on a machine.

After unhairing they are put into another pit of clean, warm water and from there they are scudded on the beam to remove all gurry and fine hair. Care must be taken in the scudding to remove the fine hair, which is very detrimental to patent leather.

WASHING.

After the hides have been scudded they are put into a wash mill and washed for fifteen minutes with running cold water. They are then ready for bating, which is done in the same manner as hides unhaired with sulphide, except that it takes about twice as much time to bate them. After the hides are bated they are all handled alike, both the sulphide hides and the lime hides.

With the liming system the pits are cleaned as follows: No. 1 pit is cleaned out and started fresh every four weeks; No. 2, every three weeks; No. 3, every two weeks, and No. 4, every week. The warm water must be clean every day and the sulphide paddle must be cleaned for every pack of hides put through.

PICKLE.

After the hides are bated they are washed for 10 minutes in a wash wheel with running cold water. They are then ready for the pickle, which can be used in either a paddle wheel or a pin mill. If a pin mill is used, make up the pickle as follows: For every 100 pounds of hide weighed after bating, use 1¼ pounds of sulphuric acid, 18 pounds of salt and 12 gallons of water and put the hides in the mill. Put the pickle through the gudgeon while the mill is going and run it two hours, then take them out and horse up to drain at least 24 hours.

To pickle in a paddle tub, the number of gallons the tub holds must be ascertained when it is filled so the bottom of the paddle touches the water. For the first pickle add 40 pounds of salt for each 100 gallons of water in the tub. Get the weight of the pack and for each 100 pounds of hide add two pounds of sulphuric acid, 66 degrees test. Put in the hides and run them for two hours and allow them to

rest over night. The next day run them 15 minutes and horse them up to drain for 24 hours, after which they are ready to split.

They can be prepared for splitting by either pressing and then dry-milling them, or by running them through a Quirin wringer and then split. They could be split while wet by using a corrugated gauge roll in the splitting machine. Hides that have been pickled, pressed and split will gain in substance when tanned. For instance, hides split in that condition at two ounce weight will make three ounce leather when finished. When the grains are split they should be dusted on the grain side with talc powder and shaved to remove all uneven spots. They are then ready for the tanning.

TANNING.

The splits are sorted from the grain and the extremely light ones are shaved on the flesh side and tanned for gusset splits. The heavy ones are washed in a Glaubers salt solution for one-half hour, using four pounds of Glaubers salt and 10 gallons of water for each 100 pounds of splits. They are then ready to tan into vegetable tannage splits.

The grains can be tanned either with the one or two bath system. Good leather can be made either way. There is more leather made with the single bath than the two-bath, because it is much safer to handle and the cost in both labor and material is less.

If the two-bath system is used, take the hides from the shave and make up a chrome solution as follows: For each 100 pounds of pickled hide weighed after shaving, dissolve 6 pounds of bichromate of soda or potash in 6 gallons of water, then add 8 gallons of cold water. Put the chrome solution in a mill and put in the hides and run the mill 3 hours. Take them out and horse them up smooth to drain for 24 hours. Now dissolve 16 pounds of hyposulphite in 8 gallons of water and add 6 gallons of cold water to cool it down for each 100 pounds of hide. Place the chromed hides in the mill, add the hypo solution, put on the door and start the mill. After running it 15 minutes, add 4 pounds of muriatic acid to 3 gallons of water and feed the acid solution through the gudgeon and run the mill 3½ to 4 hours, when the leather will be tanned. After it is tanned it is horsed up until the next day, when it is ready to wash.

RUBBER GLOVES MUST BE USED

when handling the hides in the chrome solution, as it is poisonous and liable to cause blood poison. When the one-bath system is used it is not necessary to have rubber gloves, as there are no materials used that will make the hands sore. The hides are taken from the shavers and for each 100 pounds make a solution as follows: 4 pounds of

common salt, 1 pound of Glaubers salt and 10 gallons of cold water. Run the hides in this solution for one-half hour, then drain the mill and make up a tanning liquor by dissolving 12 to 14 pounds of commercial one-bath tan liquor in 12 gallons of water. Add 6 gallons of this solution to the hides and run the mill an hour, then add the remainder of the liquor and run the mill until the hides are thoroughly tanned. In order to be sure that they are fully tanned, boil them for two or three minutes. If they contract they are under-tanned and must be kept in the tan liquor until they stand boiling.

EXAMINE THE LIQUOR.

After the hides have been tanning a reasonable length of time, say 4 or 5 hours, examine the liquor to see if it is exhausted. If it is, and the hides are not tanned, add more liquor to the mill, as there is no positive method of telling just how much tanning liquor hides will take. Some hides tan with less liquor than others.

After the leather is tanned, either horse it up or place it in smooth piles to press and drain at least 48 hours. It is then ready to proceed with as follows: Weigh the leather after it has drained 48 hours, and for each 100 pounds dissolve 2 per cent of lump borax by boiling in 3 gallons of water, then cool it down to 90 degrees Fahr. by adding cold water and have 10 gallons. When ready to use, place the leather in a mill that is entirely free from acid and put in the borax solution and run the mill 40 minutes. Drain off the water and wash with a generous supply of running water for an hour; if there is no water connected with the mill, wash in six changes of water, draining the mill after each change. The washing of chrome leather is a very important part, especially when it is for patent leather.

After the leather is washed until it is perfectly free from acid it is ready to color. The coloring of chrome leather for patent finish is where many tanners make mistakes. Do not try to get a penetration of the color into the leather or the leather will be tender on the grain, and if it is carried far enough the fiber of the leather will be tender. This applies to patent leathers only, as the oil that is put into other leathers will prevent the color from making it tender. Do not use a striker of any kind in coloring. To get a good surface color take 1½ pounds of regal black for each 100 pounds of hide and dissolve same in 3 gallons of water. Add enough water to make 10 gallons and use it at 120 degrees; no higher. Run the leather in this dye bath 20 minutes, then add 4 ounces of logwood crystals and 2 ounces of extract of fustic that has been dissolved in a small amount of water and cooled down to 120 degrees before putting it in the mill. Run the leather 15 minutes in this second dye bath and then drain the liquor from the mill and wash the leather with two changes of clean warm

water 100 degrees. Drain off the water and the leather is then ready for the fat liquor.

TWO FAT LIQUORS USED.

Two fat-liquors are used. Some tanners make a fine line of patent leather with an alkali fat-liquor and others swear by an acid fat-liquor. Those who use the acid fat-liquor or sulphonated oil claim that an alkali fat-liquor makes tender leather, while a sulphonated oil, if made right, is a neutral oil and of great benefit to the leather. It has a natural affinity for chrome leather and when the leather is degreased the oil will all come out and the leather is left perfectly clean. An alkali fat-liquor will nourish leather while it is in it, but after degreasing the oil and soap will come out with the naphtha. The dry alkali remains in and makes the leather dry and crusty and in a short time the leather will be tender.

ALKALI FAT-LIQUOR.

If an alkali fat-liquor is to be used, make it up as follows: For each 100 pounds of leather dissolve ½ pound of borax chip soap by boiling in 2 gallons of water. When it is dissolved add to it 3 pounds of good neatsfoot oil, 1½ pounds of cod oil, 1½ pounds moellon degras and boil for half hour. Keep it boiling this full time, then take out the steam pipe and allow it to stand 3 or 4 hours. Dissolve 4 ounces of salts of tartar and stir it into the fat-liquor. Add water to make 12 gallons and use at a temperature of 130 degrees Fahr. Run the leather in the fat-liquor fully 30 minutes, then horse it up over night. Be sure the leather is at least 100 degrees warm before putting in the fat-liquor. If it is not, give it a run for 5 minutes in water 120 degrees to warm it up, or the fat-liquor will not go into it as freely as it should in order to obtain good results.

A great many tanners will say that it is wrong to boil moellon degras, and I agree with them when true moellon is used, but I will say there is very little true moellon degras made today. The material we get today and call moellon degras is an article composed of various oils and greases put together by a chemical process, including water, and has never been near a skin of any description unless it was when some of the wool grease was being scoured from the sheep wool. Nevertheless, this so-called moellon degras is a good thing to use in a fat-liquor where the leather is to be degreased, but my contention is that the boiling of this kind of moellon is of benefit rather than a detriment.

SETTING.

After the leather has been lying on a horse from the fat-liquor over night, it is given a good hard setting on the grain to get solid,

non-stretching leather. If a setting machine is used, give the leather two settings on the grain, then give it a setting by hand on the grain to remove the pleats in the shanks made by the machine. If no machine is used, set it by hand, then hang it up until it is about half dry and reset it again good and hard. If the edges are too dry to reset wet them with a little warm water and a sponge. It will be very difficult to make the leather adhere to the setting table after it has been through the setting machine or has been set once by hand, and it is necessary to use a setting slush.

FORMULA FOR SETTING SLUSH.

The formula is a very good one for chrome leather: 3 pints of German degras, 3 quarts of No. 2 finishing oil, 1 pound of hard soap, 2 pounds of flour. Dissolve the soap by boiling in a gallon of water, then mix the flour into a thin paste without lumps and add it to the soap solution and boil 10 minutes. Add enough water to make 3 gallons and stir the soap and flour solution into the degras and oil, which have been previously mixed together. When all have been thoroughly mixed add enough water to make 6 gallons, and also 4 ounces of carbolic acid to prevent the slush from getting sour.

After the leather is perfectly dry it is dampened in hot water and packed tight in a box to mull for 24 hours. It is then staked and tacked on frames to dry, when it is sent to the naphtha works and degreased. It is then staked again and is now ready for the japan finish.

If some of the leather has a rough grain, it should be buffed on a buffing machine, using No. 130 emery paper or emery cloth. The buffing is done after the leather is degreased and before it is staked the second time. The degreasing is an important part of the operation of making perfect leather. The leather should be given a bath in warm naphtha for 6 to 8 hours, then taken from the naphtha and hung out in the air to allow the naphtha to evaporate. Do not allow the leather to be placed in a hot room or oven after coming from the naphtha, as it is deleterious to the leather and will cause shrinkage of from 2 to 5 per cent. I have made tests of the various ways of degreasing and find the above method, while a trifle more expensive, the best and cheapest in the long run.

ACID FAT-LIQUOR FOR CHROME PATENT LEATHER TO BE DEGREASED.

To make this acid fat-liquor it is quite necessary to have the right kind of apparatus. To make a small amount of it at a time, fit up the apparatus as follows: Take a large barrel and saw off about one-eighth of it from the top. Get an earthen jar holding 25 gallons, put

two strips of wood two inches thick and the length of the diameter of the inside of the bottom of the barrel into the bottom of the barrel, then connect a 1-inch water pipe near the bottom of the barrel and a 2-inch hole 2 inches from the top of the barrel and put the jar in the barrel, setting it on the cross-pieces of the wood.

Take 4 gallons of 30 degrees cold test neatsfoot oil and 4 gallons of No. 2 castor oil and put them in the jar and mix them together. Turn on the water and allow it to run until the oil is thoroughly chilled. In the meantime, put a shelf up over the jar about 2 feet from the top of the jar. On the shelf have an earthen jar holding about 1 gallon, with a hole near the bottom, so as to attach a small lead pipe. (We have an earthen ice water jar, from which we took the faucet and fitted in the lead pipe, with a lead faucet near the end.) Put 24 fluid ounces of sulphuric acid in the jar and when the oil is chilled open the faucet so a small stream of the acid will run into the oil. Have a good strong paddle made and keep stirring the oil all the time the acid is running into the oil. Have the acid so it will take 10 minutes to run into the oil. If it runs any faster it will burn the oil. Six hours after the first amount of acid has been added to the oil, add a similar amount of acid the same way and allow it to stand until the next day. If the oil is warm it is a good idea to allow the water to run in the barrel all night to cool it down, or put some cracked ice in the water around the jar. The next morning add the same amount of acid in the same way, and 6 hours later add a similar amount of acid as before and again allow it to stand over night. The following day take a clean barrel that will hold at least 50 gallons and stand it on a platform about 3 inches high. Put a spigot in the side of the barrel about 3 inches from the bottom. Put the acid-treated oil in the barrel and then dissolve a 3-gallon pail of Glaubers salt in 30 gallons of warm water 75 degrees Fahrenheit. Put this Glaubers salt solution in the barrel with the oil and stir it well for about 15 minutes, then add cold water until the barrel is almost full. Stir the oil and water together for 3 minutes, then allow it to stand for 7 hours, when the oil will separate from the water and come to the top. Open the spigot and allow the water to run off until the oil starts to come out, then close the spigot and give the oil a second washing in the same manner as at first, using 2 pails of the Glaubers salt and the same amount of water. Allow it to stand over night. The next morning give the oil a third washing, using 1½ pails of Glaubers salt, and allow it to stand 7 hours. Give the oil a fourth washing, which will be the last, using a pail of Glaubers salt and the same amount of water. Allow it to stand over night and the next morning draw off the water same as after each washing and then stir into the oil 1 pound of bicarbonate of soda. This soda will neutralize any small amount of acid that may remain in the oil, which is then ready to use.

FAT-LIQUORING.

For each 100 pounds of leather take 5 pounds of this oil and dilute it in 10 gallons of water at a temperature of 120 degrees. Have the leather 100 degrees warm and then fat-liquor in the usual way. After the leather has been fat-liquored, horse it up to drain over night and the next day set out as described above and oil off with a light coat of oil, using a part of each mineral and neatsfoot. After the leather is dry treat it in the same manner as if it were fat-liquored with an alkali fat-liquor. The same sulphurated oil can be used for mat or glazed side leather, using 4 per cent of it for mat and 2½ per cent for glaze leather.

I mention the use of lump borax in washing the leather after it is tanned, as it is perfectly pure. A large part of the powdered borax is not pure. It is adulterated with bicarbonate of soda and alkali of a cheaper quality.

If the foregoing directions are carefully followed and the weights of the materials used, also the weights of the hides, are accurate in each pack, there is no reason why good leather cannot be made every day.

Do not weigh one pack of hides and then guess at the weight of the packs following and expect to get uniform results.

BARK-TANNED PATENT TIPPING.

For bark-tanned patent tipping the hides need a careful working in the beamhouse. A thick grain, which is produced by sharp, quick liming, is to be avoided, since this leather is split on the machine to a very light substance and needs all possible strength.

The hides in many cases are tanned and finished whole, and after being finished are cut down the back into sides.

SOAKING.

On reaching the tanner the hides are soaked for twenty-four hours and then fleshed. After fleshing they are returned to the soaks and allowed to soak over night, when they are ready for the liming. The liming should be gradual and the limes strengthened as one would the tanning liquors. After the pack has lain in the lime liquor for a day, haul it out and shift it forward into a stronger lime or strengthen up the one which it came from. This hauling and setting back is kept up at intervals for seven or eight days, when the pack is ready for unhairing over the beam.

LIMED HIDES SHOULD BE PLACED IN WARM WATER.

On coming from the limes to soften the grain and to have the scud come easily, the limed hides should be placed in warm soft water containing a few pounds of borax. The borax will prevent chalk from forming in the hide fiber and also so soften the grain that the hair will give readily.

After being unhaired the hides are worked out over the beam to remove scud and fine hair, then fleshed on the machine and made ready for the bating.

For this class of goods a fine, soft grain is necessary, which is produced by a bacterial bate. The excrement of the hen or pigeon is steeped and allowed to ripen for a day or two, when it is ready for use in the paddle wheel. The hides are run in this solution for a day and then taken from the bate and washed in warm water, when they are ready for the tan liquors.

OAK BARK FOR TANNING.

Oak bark is generally used for a tannage, making somewhat stronger fiber than the hemlock. The hides are suspended in the liquors and in eighteen to twenty days are ready to be opened on the machine. After being split the grains are retained in gambier in the drum, fat-liquored, struck out, dried and buffed on the grain.

Thousands of East India tanned kips have been stripped of the surplus tanning and finished into patent tipping. The tanned stock is cut down the backbone into sides and placed in the drum. They are then milled up in a warm solution of borax and water to remove the tannage, dirt and grease. They are next given a good rinsing in warm water and then retained in a one-bath chrome liquor. This tannage imparts strength to the fiber of the leather and gives the grain a soft feel. The sides are now rashed to free them from all acid contained in the tanning liquor and then colored.

AMMONIA BEST FOR COLORING.

For a black which will not fade in the degreasing and to leave the leather as strong as possible in fiber, many colorers believe ammonia the best to use. The ammonia evaporates and leaves the leather where other forms of alkali stay in the leather and are injurious in proportion to the amount used.

For 100 sides of leather fifty gallons of water are heated to a temperature of 130 degrees Fahrenheit, thrown into the drum and the mill started. Now take five pounds of ammonia, add to it a pail of water and pour it through the gudgeon of the drum and mill five minutes. Dissolve six pounds of logwood crystals in four pails of water, pour through the gudgeon and run ten minutes.

For a striker dissolve two pounds of leather black (E. 13) in a barrel of water and used at 130 degrees. When fat-liquoring use one ounce of alkali violet in the fat-liquor for every 100 pounds of leather.

POPULARITY OF CHROME PATENT LEATHER.

Chrome tanned patent leather has proved to be the most popular upper leather ever put on the market. We hear all kinds of complaints about how hard it is on the feet, how unreliable it is going through a shoe factory, and how difficult it is to make, but for all that, it is the only leather that will make a shoe for business wear as well as fancy dress shoes. Colored leather has its runs and makes nice shoes to dress a shoe store window with, and when that is said, it is about all that can be said in its favor, for no matter how much is paid for a colored shoe, just let it get soiled and it looks bad. A patent leather shoe can get dirty or wet and it can be rubbed off with a rag and it looks pretty near as good as new. There is no question but that it costs less to keep it looking good than any other shoe made.

CARE IN SELECTING RIGHT KIND OF HIDES.

As to the manufacture of patent chrome leather from hides, it is not a difficult thing to do when it is looked at in the right way. The reason for most of the failures in making this kind of leather is because the tanners, like most of our business men at present, want to get rich quick. They try to make a fine piece of patent shoe leather from a 50 to 60 lb. cow or steer hide, while before the advent of chrome-tanned patent leather that class of hides was worked into oil grain and cheap bark leathers of all kinds. It is simply impossible to make as fine a piece of grain leather from a hide that will weigh 50 lbs. as it is from a hide that weighs 35 lbs. I think there are quite a few tanners of chrome patent leather who will agree with me in this, for they have learned it is a fact and the lesson has cost some of them quite a sum of money.

The tanners knew, or should have had experience enough in tanning hides to know, that a nice fine piece of leather cannot be made from a large hide, but in spite of their knowledge of this fact a lot of them tried to make fine patent leather from heavy hides and are trying it today. Another thing the tanners of this class of leather must learn (a few of them know it) and that is that they cannot make a piece of patent chrome grain that will have no break in it and have it strong. It is out of the question to try it. To make a tight piece of this kind of leather you will have to sacrifice the strength of the leather. If you want leather to be as strong as lace leather you will have to take a loose grain with it. The successful tanner is the one who can strike the happy medium and be content to keep his plant going making that

kind of leather and not try to make something that cannot be made. The buyers of leather are learning that this is a fact, for they charily place orders for leather that has no break in it, for they know it will be tender and cause no end of trouble in the shoe factory.

DRY HIDES WILL NOT MAKE GOOD PATENT LEATHER.

Another kind of hides that will not make good patent leather is dry hides. There are numbers of tanners who can testify to this to their sorrow. Dry hides look good to a tanner (especially when hides are high), and they can take a pencil and figure out a large profit from them, but when it comes to working them it is a different story. Dry India kips are very alluring, for they are a nice pattern and have a beautiful clear grain to look at, but they cannot be worked into a nice piece of patent leather for the simple reason that if they are worked through the beamhouse to get a medium fine break to the grain, the grain will crack very easily, and if they are worked to make a tough grain they will be coarse.

HIDES NOT OVER 40 LBS.

A tanner making chrome grains for patent leather for fine trade must buy a No. 1 hide not over 40 lbs. He must have a system in his beamhouse that will give him the best results. If sulphide of sodium will do the trick, use sulphide, no matter what other tanners are doing. You cannot watch and listen to others and make a success of your own business. If straight sulphide will not work try sulphide and lime in their various ways. There are a dozen combinations for using sulphide and lime. The main thing in favor of sulphide is that it is a great agent in removing fine hair, and fine hair on leather to be japanned is as bad as a tender grain. There are some places where sulphide cannot be used; then the only thing left is lime, or lime and arsenic. In this combination the amount of arsenic used must be very small, as it will make a loose grain very quickly. There are no two tanners who can use the same system exactly in their beamhouse and get the same results, and it is up to each tanner to work out his own salvation in his own plant.

TANNING.

After the beamhouse work comes the tanning operation. The first part consists of the pickle, which is usually made of sulphuric acid and salt, and the amount to use depends upon the condition of the water used, and how much the hides are bated. Some tanners are so unfortunate as to have water that is full of bacteria and they cannot allow their hides to remain in the bate long enough to remove completely

all traces of the lime. If they do they get loose grain. When such is the case the hides have to go into the pickle with more or less lime in them and they will require more acid in the pickle than if the hides were entirely free from lime. If the tanner has nice soft water free from all foreign matter then he can bate his hides perfectly and use the minimum amount of acid and get first-class results. He must understand all this to get good leather, and the only way to learn it is to experiment in his own plant. No man can tell exactly the amount of acid to use to get good results.

ONE-BATH SYSTEM BEST.

When he has his beamhouse and pickle worked down to a nicety, the next question is, what system of tanning will he use? There are a dozen different combinations of the two-bath, and no one knows how many different one-bath tan liquors are used. The one-bath is the safest to handle, and if the tanner has everything else all right and a good single-bath liquor, the most difficult part of his work is done. The two-bath makes good leather, but it requires a lot of skill and watchfulness to keep it going straight, and even the best of them go to the bad—sometimes more frequently than the tanner who tans with the single bath.

PATENT LEATHER BY THE CHROME PROCESS.

In tanning hides for patent leather by the chrome process the most important part is the beamhouse work. Every detail of the work must be carefully watched each day in order that each successive lot, as it comes out, shall be uniform. By introducing a system, and insisting on cleanliness, wonders can be accomplished towards an even run of green stock. Each lot of hides should come from clean water and go into clean limes, and when bated go into a drench as nearly like that in which previous lots have been drenched as possible. Some tanners prefer using a prepared bacterial bate, while others use a chemical one made up from acids.

BEAMHOUSE WORK.

The method that we use, says a tannery superintendent, in handling the hides through the beamhouse is to first split the hides into sides by cutting them down the back; this is done before soaking, and to insure a straight line we use a frame which is made from two boards, the right length, and so placed that the space between them is of sufficient width for the blade of the knife to move through freely. The boards rest on uprights of convenient height. The hide is thrown across this frame lengthwise, the line down the backbone straightened, and the

workman runs the knife through the hide, guiding it so that it is cut in a straight line from the tail to the nose. All useless parts are cut off for glue stock and the sides are then put in the soaks. After soaking until fairly soft the hides are fleshed on the machine and thrown into clean water, to complete the soaking. The soaking having been accomplished the hides are ready for liming. Before being reeled into the limes they are toggled together, that is, tied with a rope connecting head and butt. As in many cases the sides curl on going into the limes over the reel, it is much better to pack the sides down smoothly and let them press out well before entering the limes. Time and trouble is saved in this manner, for if the sides go into the first lime in poor shape the after reeling is a steady drag and poor lining results.

IN LIMING FOR PATENT LEATHER.

Too soft leather or pipey leather must be guarded against, and it has been proven in practice that lime alone will not give satisfactory results. By using sulphide of sodium in connection with the lime a fine grain is produced, which gives the grain the appearance of coltskin. Sufficient sulphide should be used with the lime to bring the hides in four to five days into condition for unhairing by the machine. The limes need to be watched carefully and the liquor run off often or it is impossible to turn out from the beamhouse a uniform run of leather.

Since we split out of the pickle, we first wash our green sides in warm water and then run them in a drench made from lactic acid, then wash again before pickling. After being pickled the sides are packed down over night and then split on the belt-knife splitting machine. Formerly we hardened the sides a little, but by using the corrugated feed roll it was found that a large amount of labor was saved beside the extra milling that was necessary to get the stock into a thoroughly soft condition to receive the chrome liquor.

ONE-BATH LIQUOR.

For the chrome tanning we use a one-bath liquor which is put on the market ready for use. We tried for a while manufacturing our own tannage, but although we had fairly good results, we came to the conclusion that it was safer to buy the prepared liquor.

After the stock is tanned it is horsed up for 24 hours before washing, and after being washed in the borax water it is colored. In the coloring process we are careful that only enough dye is used to give a good color and that all surplus dye is washed out. In fat-liquoring we like a soap that has some tallow in it, and we also use neatsfoot oil and moellen degras. All our stock is degreased. We know nothing about fat-liquoring for patent leather which needs no degreasing.

After fat-liquoring the leather is put out and dried in as even a temperature as possible. When dry it is dampened in sawdust and staked, then stretched on the boards. When dry this time it is pulled off and sent to the naphtha works. From there it is sent to the japanning works.

RULES FOR MAKING CHROME PATENT LEATHER.

Tanners of chrome leather would save themselves many dollars if they would adhere to the following rules:

Use enough lime or sulphide to remove all the natural grease in the hides or skins, as there is nothing in the process of making chrome leather that will remove the grease without injury to the hide except the liming or sulphiding. If the natural grease is not all removed the leather will never be right. It will shrink on the drying frames, and when it is put into the japan ovens it will contract so as to pull loose from the frames. Of course all chrome leather contracts much more than vegetable-tanned leather, but if the animal grease is all removed the shrinkage will be much less. The reason for this is that chrome tannage will not absorb the grease and when the heat strikes the leather the grease will become dry and cause the leather to draw. Another bad feature is that the grease will come to the surface on the grain side and nothing will cover it or remove it.

IN FAT-LIQUORING FOR PATENT LEATHER

a fat-liquor should be used that does not have to be removed with naphtha before japanning. There are various reasons why this should be done. The most important is to save measurements. Now this will appear as very strange to some tanners, to think that if he does not get all the natural grease out in the beamhouse his leather will shrink, and then if he does not allow his fat-liquor to remain in the leather it will shrink; the reason is just this: the oil to be used in a fat liquor must not be an animal oil, but some oil that will stand heat to a certain degree. There is no animal oil that can be used in a fat-liquor for japan leather. The next best argument in favor of not degreasing is that the leather is much stronger and will last longer in the shoe if there is a grease or oil of some kind in it to act as a nourishment for the leather. No one can dispute this, for we all know that any kind of leather wears better with oil in it, and chrome leather is no different in this respect.

COLORING.

Now in regard to coloring leather for japanning. Do not use any more coloring material than is absolutely necessary, for the more you use the more liable you are to have a tender grain, a thing that must be guarded against to the utmost degree.

Many tanners will follow the above rules in every detail, and when

their leather is measured from the japan shop it will show a shrinkage of from 10 to 14 per cent. But if the tanner would take a walk through the shop when his leather is japanned he can see from 4 to 6 per cent of his leather lying on the floor in trimmings. There is no excuse for this, if the japanner will use a little common sense and get some toggles to use in place of using a piece of wood with a string. I have seen them cut a hole in the leather, put in the stick and roll the leather around the stick, then fasten to the frame. When the leather is taken from such a toggle it must be trimmed at least an inch and a half from the edge, so it is easy to find his shrinkage. There are japanners who use a toggle that will only require a trimming of one-fourth of an inch to get the leather ready from the frames. Such japanners should be encouraged in doing business. You will find many japanners who will say the best leather is the kind that has been degreased, but invariably such japanners cannot japan leather with any grease in it. The time is soon coming when the shoe manufacturers will demand patent leather that has not been degreased.

Another practical tanner writes:

Hides from chrome patent leather should be selected in the beamhouse after they have been unhaired. Nothing but small pattern hides should be put into patent leather and they should be plump hides or as near as it is possible to get them, for a light thin hide will be of a loose texture, while a small plump hide will make a fine close piece of patent leather. To work hides through the beamhouse for patent leather some system of sulphide of soda or lime and sulphide should be used, so as to get all of the fine hair out, as fine hair in leather to be japanned is one of the worst things to contend with. After all traces of fine hair have been removed, the hides should be washed from 10 to 20 minutes in a wash wheel. They are then ready for the puer. Care must be exercised not to get them puered too much, also to get the lime out. If puered too much your leather will be loose and break coarse. If not puered enough your leather will be harsh on the grain, and the grain will be tender and crack easily. The reason for this is the grain will be thick and firm, while if they are puered just right the grain will be thin and have enough elasticity to stand a great amount of hard usage and not crack.

WASHING.

After hides are puered they should be washed about 5 to 10 minutes in lukewarm water to cleanse the grain. They are then ready to pickle, which is done as follows: For every 100 lbs. of hide make up a pickle liquor as follows: Dissolve 4 lbs. sulphate of alumnia by boiling and add 10 lbs. common salt. Have 12 gals. of pickle liquor. When done, use cold. Run the hides in the pickle liquor one hour in a mill, then pile them down over night. They can then be pressed, put out on a

Turner putting out machine or hung up and sammied and split. It will be much less difficult to get a uniform job of splitting done than if they were split out of the lime. Some splitters can do a very fine job splitting from the lime, but they are few and far between. Hides pickled with alumnia and salt will split just as easy as bark tanned leather, and the splits are just as good as those split from the lime, but hide pickled with acid and salt will not produce as good a split as hides split from the lime, as the acid and salt pickle has a tendency to reduce the hide substance.

SHAVE WHILE IN PICKLED STATE.

After the hides are split the grains can be shaved while in the pickled state, and this will save putting them out for shaving after they are tanned. The grains are ready to tan in either two or one-bath. One-bath is the best, as it gives more measure and in tanning one-bath for patent leather it can be tanned in a mill until what most tanners would call tanned, and it is tanned for all purposes. Except patent leather for japanning, should be taken from the drum after it is tanned and put into a layaway liquor for 4 or 5 days, and then taken out, drained 24 hours, then washed, stained and fat-liquored. The advantages gained by this layaway liquor are these: The leather will not require as much fat-liquor to make it soft; the less fat-liquor the less trouble in japanning, but the best thing is in saving in measurement. Hides placed in a layaway will not draw and shrink as much as leather not tanned this way. To make a layaway liquor, put 5 gallons of 25 degree Baume scale, one-bath tan liquor in 100 gallons of water and put your hides in it; handle them every day. This layaway liquor can be used over and over again by putting 3½ gallons of tan liquor in for each pack after the first pack. About 50 medium sized sides can be put into 100 gallons of liquor.

JAPANNING CHROME PATENT LEATHER.

We hear a great many complaints about making chrome patent leather—that it is a very dangerous undertaking. This is true when a man sends his leather to a japanner who finishes the leather at so low a price that he must use the cheapest materials, and pay the minimum amount of wages. There are a number of firms finishing patent leather who have not the first rudiments of making a japan finish. They do not know what the different materials used in making the "daub coats" or "sweet meats" coats will do after being put on the leather, or what the varnish will do if the "daub" is not right. There are thousands of feet of leather ruined by the so-called spew or bloom. When patent leather spews after it is finished, it is not good for any

use. This spew is almost always laid to the fat-liquor used in making the leather. If the leather has been degreased, the man who did the degreasing gets the blame for not removing all the grease. The fact is that nine-tenths of the spew is caused by the "daub coat" not being thoroughly dry when the varnish is applied. Leather which contains enough oil or grease to cause it to spew will never take the varnish coat smooth. It will cause the varnish to crawl and leave pit marks when finished.

CRACKING GRAIN.

The worst thing to contend with in patent leather is cracking grain. A large amount of tender grain is caused by finishers of patent leather using too much heat when baking the finish. Much better results can be obtained by using less heat and keeping the ovens at a uniform temperature than by allowing the heat to go from 120 to 185 degrees during the period of baking. Thousands of dollars are lost by not having the ovens kept at proper heat. I have seen leather that went into the hands of the finishers perfect in every way, with a grain almost impossible to break, come back from the finishers with the grain so tender that it could not be used for any kind of a shoe. The tanner is always blamed for this, and he will try to get his grain stronger, with the result that his tannery is all upset, and his leather comes out loose and pipy on the grain. The trouble really is all caused in the japan shop.

Some leather is made tender grained by putting on too many coats of finish. Every tanner of patent leathers knows that a thick coat of japan will not stand lasting. There are some finishes of patent leather who use the guncotton finish and do not use a very high degree of heat in baking their finish. This will cause the leather to crack, even if it was tough on the grain when it came into their hands. The great danger in using guncotton finish is that the finisher does not know just how much oil to use in making up his daub. If his leather has no oil or grease of any kind in it, he must use quite a large amount of oil in his daub. If the leather contains oil, and his daub has the maximum amount of oil in it, then his finish will peel off. If the leather has no oil in it and his daub the maximum amount of oil, the daub will go into the grain and cause it to be stiff and brittle, and crack. The guncotton finish will oxidize much faster than the linseed oil finish, even when it is used under the most favorable conditions. But when it is used on a lot of leather which contains no oil, and the daub does not contain the proper amount of oil, it will oxidize much more readily than any other japan finish.

The favorable points about a guncotton finish, when it is made and used right, are the flexibility of the composition, the low temperature at which it can be applied, the small amount needed to give a good

bright face, and the fact that the daub coats can be applied with a brush.

BE CAREFUL OF FINISHING IN HOT WEATHER.

One of the main things to be remembered in finishing patent leather is that it cannot be finished successfully in hot weather. Japan that is put on in the hot summer months and allowed to lie any length of time will not go through the shoe factory without trouble. This has been tried repeatedly by the oldest japanners in the country, who have come to grief with every trial. When finishers of patent leather learn to do their work in seasons suitable for it, they will save themselves and others a lot of trouble and expense.

Patent leather should never be made and stored away face to face, as it will always stick together when packed in this way. Finishers of patent leather should try to arrange their plans so as to carry a small amount of finished leather, as it is almost impossible to keep it from deterioration. I have seen patent leather which had been in storage for three months appear to be in first-class condition when sorted over to fill an order, and forty-eight hours later, when this same leather was looked over, it was found to be stuck together so tight that it could not be pulled apart without pulling off the finish.

There are some finishers who claim they can get patent leather apart without damage. I have never seen anyone who could do it. If it is necessary to carry finished leather in stock, it is a good scheme to put a sheet of cotton wadding between every two sides, and fold them together in a wide fold, being very careful not to place many in a pile, so that the weight on each piece will be light. Patent leather can be made just as well as any other leather, but it must have something more than "slap dash" methods in getting it out. If tanners of patent leather would not try to get their leather finished too cheaply, and be willing to allow the japanner to make some money, they would get better finishing and experience less trouble. They should remember that the finisher of patent leather is like the farmer making hay —he must have sunshine, and the sun does not shine every day.

PATENT TIPPING FROM INDIA-TANNED KIPS.

A very good grade of patent tipping can be made by the following process: Take the tips from the bale and split them into sides, then dampen and lay in piles over night. The next morning split the grain off at a 2½ or 3 ounce weight. They are then put into a mill and washed for forty-five minutes in warm water 85 degrees Fahrenheit. Drain the mill and retan in a combination liquor of gambier and hemlock, using a 3-gallon bucket of 20 degree liquor to every twelve sides. Run in this liquor for thirty minutes. Pile down over night

and in the morning hang up and dry. When bone dry have them degreased, then dampen and give a fat-liquor of 4 ounces of salts of tartar dissolved in 3 gallons of hot water 125 degrees, and stir in 3 pounds of good moellon degras. Stir well and mill the hides in the fat-liquor for thirty minutes. This amount of fat-liquor is for fifty sides. After they are fat-liquored, set out on the grain side and tack on frames to dry. Buff off the grain and if they are stiff stake light, when they will be ready for the japan shop.

It may sound strange to some tanners to tell them to degrease the fat-liquor, but India-tanned leather has some kind of grease in it that is impossible to wash out, no matter how much alkali is used, and it is impossible to japan the leather with this grease in it. If you do not give the fat-liquor the leather will be dry and tender. There is no danger is using a good moellon degras, for all the bark tipping, carriage and furniture leather made is stuffed with moellon degras.

Bag, Case and Pocket Book Leather.

TO MAKE POCKET-BOOK AND BAG LEATHER OUT OF LARGE, SPREADY HIDES.

Tanners sometimes have large, spready hides and do not know just what kind of leather to turn them into so they will not lose money on them. This kind of stock is sometimes turned into collar leather and sold at a very small profit. When there is a belt knife splitting machine it can be turned into pocket-book and bag leather and sold at as good a profit as any other leather.

The following method is the cheapest and best to make this kind of leather: Split the stock from the tan at about six ounce substance, which will give the tanner a good butt split. Scour the grain well and oil them in a wheel if possible. Put in about a pint of oil to each side in the wheel and let run for 20 minutes. Then hang up to dry. After they have been dried out and laid in a pile for a few days, damp by dipping in warm water and set out with very little oil on the table and hang up by the head and tail if possible so as to keep their shape; or, better still, tack on frames.

After the sides are dry black the grain with logwood and any good grain black and dry out. Then give a coat of black grain finish.

A FINE BLACK LUSTER.

The following gives a nice black luster that is lasting: Eight ounces of extract of logwood, 1 ounce bichromate of potash, 2 ounces prussiate of potash. Stir in two gallons of soft water and boil until all the ingredients are dissolved and then cool. When cool, strain. To each gallon of above add two quarts of beef blood. Blood albumen can be used instead of beef blood if desired. Give one even coat with a sponge and let it dry in.

PRINTING AND EMBOSSING.

When the sides are ready to be printed or embossed, which is done with a jack and pebble roll, damp the grain evenly so as to take the print without the impression cutting the grain. Then grain up well

and soft-board so as to get the stock as soft as possible before splitting off the grain for pocket-book leather. If the stock has been softened properly in the graining process, the splitting is as easily done as with any other kind of leather, but if hard spots are left in the sides they are liable to produce holes in the grain side. This can be prevented by dampening the grain with a sponge and warm water just before splitting. The grain is split at 1½ to 2 ounce substance, which leaves a split from 4 to 4½ ounce substance for bag leather. The grain is already finished when it is split.

TO MAKE BAG LEATHER.

To make bag leather out of this split, proceed as follows: Make up a black by boiling 1 quart of logwood chips in 2½ gallons of water and ½ pint spirits of ammonia, and strain. Then add ¼ pound French velvet black, ½ pound chip or common bar soap, and boil slowly. When soap is dissolved, add 1 pound package of silver gloss starch or corn starch, dissolved in 2 quarts of water. Add slowly while the water is boiling, then add 2 ounces of nigrosine and 1 ounce of tincture of iron, and boil well for twenty minutes. Place the splits to be blackened on a table, grain side up, and give a coat of the black with a fairly stiff hair brush. Rub the first coat in well and dry out, and give the second coat with a sponge, and this is all the finish they need. When this second coat is dried out they are ready to be printed the same as the grain, but they will stand much heavier pressure. The embossing machine gives better results than the jack for any of this stock.

MANUFACTURE OF BAG, STRAP AND CASE LEATHERS.

For the above leather, fresh salted hides are the best for colors, says an experienced man. The hides should be soaked for at least 24 hours and then brushed either with a knife on flesh side or by machine and returned to a pit of clear water.

LIMING.

For liming 40 hides, two and one-half bushels of lime are dissolved in cool water and then add to vat. Hides must be handled twice on the first day, once in the morning and once in the afternoon, and once each succeeding day for six or seven days. After the third day add one and one-half bushels of lime, making four bushels in all. On the sixth day the hair will begin to slip freely. Seven days are better, as high lime will give a nice grain and soft leather, which is preferable for bags.

UNHAIRING.

The unhairing may be done by machine or hand. After unhairing place hides in clean water and by no means leave them exposed to the air, as it will cause the leather to become cloudy. Then work out on beam by hand, using the worker and a knife to remove the short hair, and return to clean water.

BATING.

For bate use one and one-half bushels of bran to twenty-five gallons of water, and scald. Let stand until sour, add to water in paddle wheel and heat to 85 degrees in summer and 90 degrees in winter. Enter hides and run in wheel for two hours, let stand for one hour and run two more hours. They will now give a good impression by squeezing between thumb and forefinger. It is not good to bate hides too low, as it gives a soft flabby grain, causing it to run.

TANNING.

For tanning, a good liquor is made by using two-thirds hemlock and one-third oak bark. Before entering hides it is a good rule to run hides in a sour liquid until a nice even color is obtained. Then enter hides in a tan liquor in vat at 6 to 7 degrees barkometer, placing hides so that no air will remain to form tan clouds. Hides must be handled twice the first day and once each succeeding day, adding liquor until you have 10 to 11 degrees barkometer. When about half tanned, they are ready for splitting and may be put in press.

After splitting and shaving the skins go to the mill. That is, the grain side. Whether any stains are in the leather or not, a good plan is to wash the grains in a solution of four pounds of borax for twenty minutes, then draw plugs and wash. After washing, return plugs and give about fifteen gallons of water and two pounds of oxalic acid dissolved in two gallons of warm water. Run ten minutes and wash until all acid is removed.

RE-TANNING.

They are now ready for re-tanning. A good liquor is made by taking two gallons of quebracho extract and put in it one gallon of sumac extract, and one pound of common salt. Add enough water until this mixture measures 20 degrees on the barkometer. I merely mention gallons to illustrate that the liquor should be two-thirds quebracho and one-third sumac, and I think my method will make it clear so there will be no mistake. Run hides in drum one hour. Then do not wash out, but fold hides, grain side in, and pile up without any creases over night, covering to keep air and dirt away from hides.

The tanner must use his own judgment as to strength of liquor required for re-tanning.

The leather is now milled in lukewarm water and lactic acid (one gallon) until perfectly clean, then water is run off and leather is ready for coloring. Mostly all aniline houses can furnish the colors, but a better way would be to have a practical dyer attend to the coloring and also the re-tanning.

After coloring, the leather must be well washed out, then slicked out on the flesh side, applying a light coat of cod oil rubbed in evenly with a bristle brush. Then set out on grain side and oil off with shearling, using judgment not to apply too much oil.

The leather is now ready for tacking, and to insure good results should be taken from the table to the tacking frames without spoiling the shape of the leather. Bag leather and the different grains which are split after finishing should not be forced in the drying. Fifty to sixty hours will give a nice pliable piece of leather.

Season for colors: Two ounces of casein, two ounces of shellac, one-half ounce 4 F ammonia, one gallon of water. Boil all until dissolved, stirring continually. Let stand over night or until cold. Add one gallon water and one-half ounce of glycerin, mixing all together. Apply with a sponge, giving an even coat, then dry.

The leather is now ready for glassing on machine. After glassing it may be grained by arm board and embossed, which is the concluding process.

MANUFACTURE OF BAG LEATHER.

The first thing is to use a 50-pound No. 1 hide. Soak 24 to 36 hours, then flesh, clean and lime six days, using 6 to 8 pounds of lime and 2 to 3 pounds of sulphide of soda. Always slake the lime, then dissolve the sulphide and mix well into the slaked. Allow six days for the liming. This beamhouse system can be changed to suit the conditions of the water used. The main thing is to have the hides come from the lime hard, and at the same time have them unhair easy, so as to avoid having any fine hair. Have the beam hands understand that their working knives must be in the best of condition, for much damage can be done to the grain if poor beamsters are employed.

BATING.

After the hides come from the unhairing machine, place them into warm water and work them over the beam from the warm water. After they are worked, they are bated, using a clean bacterial bate. Do not bate too long—just enough to remove the lime from the grain. After bating, wash for five minutes in cold water and throw into cold

water over night. The next morning tack on to sticks and hang into a hemlock extract liquor 7 degrees. Handle every day for three days and work up to a 10 degree liquor, using hemlock liquors only, and do not have a liquor that is sour. After they have been in the 12 degree liquor 24 hours, pass them on to a combination liquor of chestnut wood extract and quebracho, 16 degrees, and work up to a 20 degree combination liquor, taking 16 days to do it. They are then pressed or put through a wringing machine. For splitting, do not press too hard; the more moisture there is in the grain when you re-tan, the better the results will be. In other words, if the grains are pressed dry and split when you come to re-tan, the more difficult it will be to get good results, and the reason is this: If the grains are dry you will have to mill them in a weak liquor to prepare them for the strong re-tan liquor, and when you are wetting them you are pounding them so they will be loose and pipy.

THE RE-TANNING LIQUOR

is made up quebracho and gambier, using three parts quebracho and one part gambier. Have the liquor 24 to 28 degrees strong, run in mill one hour and pile down 24 hours. Then give them another one-hour run and pile down 24 hours. Very good results can be obtained by using a little bisulphide of soda in the re-tanning liquor. We use about one pint to each three gallons of liquor. It will help the liquor to penetrate much faster. After they are piled down the second day they are ready for the bleach, which is done as follows: To each 50 sides use 1½ pounds of gold dust washing powder in 50 gallons of warm water. Run 20 minutes and then wash off in clean, cold water, 10 to 15 minutes; then give them a run of 10 minutes in 50 gallons of cold water, into which one pint of sulphuric acid and eight pounds of salt have been dissolved. Now wash for 15 minutes in cold water. They are then ready for the fat-liquor. For 50 sides use one pound olive green soap, dissolved by boiling. Cool to 150 and stir in four pounds of moellon degras; fill up the barrel to 50 gallons and use at a temperature of 120 degrees. Run leather in fat-liquor half hour.

The soap will darken the color a little, so we drain the mill and put 50 gallons of cold water, into which one quart of lactic acid has been stirred, into the mill and run the mill five minutes. The leather is then set out with a rubber slicker and hung up to dry. When dry put it back into the mill and give the re-fat liquor as follows: Half pound olive green soap that is neutral, dissolved. Then stir in three pounds of moellon degras in 50 gallons of warm water. Run 20 minutes, drain, mill and wash off with 50 gallons of warm water, 80 degrees. Wash five minutes and drain. Now mix up your color and strain it into 50 gallons of water, 85 to 90 degrees. Run leather in coloring bath for half hour, take out and dip into clean, cold water, one side

at a time; then hang up until partly dry. The reason for not setting out is that you will work the dye from the body of the side out into the flanks, belly and edges, and when the sides are dry, the flanks, bellies and edges will be a shade darker than the rest of the side.

COLORING.

If the color is not as dark as you wish it, you can easily make it a shade or two darker by dissolving four ounces bichromate of potash in six gallons of water and adding two ounces of acetic acid to the bichromate solution, and putting it into the mill with the leather and spent dye liquor and running it 15 minutes. After the sides are dry we stake them on the Slocomb staking machine, which we have found to give the best results. When it is staked it is given a coat of cornmeal filling, that is made as follows: One quart of dry cornmeal is boiled slowly for half an hour in a gallon of water, then allowed to cool. Rub this into the leather hard. When dry it is rolled and given the first coat of finish. A good waterproof finish is made as follows: Dissolve three pounds of casein into one gallon of formaldehyd and put into a jug. Keep well corked. Then dissolve one pound dextrin in a gallon of water and add one pint of vinette. Stir well. Boil two ounces of cornstarch into two quarts of water and stir into the finish. Now take half pint of the dissolved casin and add to the finish; strain well, and it will be ready for use.

The splits taken from these hides can be worked into Goodyear by trimming, after they are split and re-tanned in a paddle wheel, with a combination of quebracho and chestnut extract. They should be run into a mill with a weak liquor for one-half hour, so as to break up the crust caused by the belt knife. Then put into a paddle of 16 degrees liquor and left there 48 hours; then place in piles for 48 hours; return to paddle and leave in 48 hours more, running about four hours during the day—say, two hours in the morning and two hours in the afternoon. When they are well filled they are allowed to dry in the piles six to eight hours, then put into a mill and given a run in the following mixture: For 50 Goodyears use four pounds flour, eight pounds epsom salts, one gallon cod oil, one gallon moellon degras and ten pounds talc, all mixed up together into a smooth paste; then add warm water, 85 degrees, to make 25 gallons. Run the splits into this solution one-half hour, and then place in piles over night. In the morning set out good in an Irish moss and flour paste. Hang up and dry. When dry give a coat of Irish moss and talc on both sides and roll hard; then dry.

THE GRAINS THAT ARE IMPERFECT

can be worked into patent tipping by taking from the splitting machine and washed up in Pearline washing powder, using one and one-half

pounds to each 50 sides, dissolved in 50 gallons of water, heated to 90 degrees, for one-half hour, and then wash in clean, cold water for 15 minutes. Then take 15 gallons of one-bath chrome liquor that is 25 degrees Beaume scale, and put it into a barrel, fill up with cold water, and run sides in the chrome liquor one hour, and pile down over night. The next morning wash for 15 or 20 minutes in running water. Then give three quarts of extract of fustic in one-half barrel of water. Run one-half hour. Make up a fat-liquor of two pounds of neutral chip soap, dissolved, and stir in nine pounds good moellon degras; add water to make 50 gallons. Run the leather in this fat-liquor one-half hour, and place in a pile over night. The next morning set and tack on frames. When dry, buff the grain and stake. They are then ready to japan.

BAG AND CASE LEATHER FROM ROUGH STOCK.

To make bag and case leather from rough stock, care should be taken in selecting sides free from scratches, grubs, salt or bark stains. It is quite important that the leather should be of a nice light color and soft tannage, which makes it much easier for producing splendid results. Nice bag leather can be made from some of the so-called hard tannages, but a deal of extra work would have to be put on them in comparison with the lighter, softer stock.

If you want to produce first quality bag or case leather, 14 pounds weight to the side is the limit. Such weight will measure, when finished, about 24 feet to the side, which is large enough; anything over that will run coarse and flabby.

WEIGH LEATHER CAREFULLY.

First weigh your leather carefully and then trim. Wet down 25 sides for a batch; let them lie over night and have them stoned out on the jack in the morning. After being skived on the belt knife machine split them from 2 to 4½ ounces per foot. The 2 ounce leather will do for suit cases and the 4 and 4½ ounce leather will answer for the bags. Split your lightest sides first and your heavy keep for the last. I should have mentioned that grading for heft should be done before splitting. Next put them in a pin wheel with 5 pails warm water and a small quantity of borax and run 15 minutes. If the leather is dark, greasy and dirty, use more borax; if clean and clear, don't use as much.

Run off the borax bath and put through acid bath to clear them of machine stains. Take 10 pails of warm water with sulphuric acid strong, if the side requires it; run 10 minutes in mill, then rinse water.

Next have the mill clean and empty; put sides in it and make a sumac bath strong and hot and add handful of salt. Mill in strong sumac bath 30 minutes; rinse in clear warm water and slick on flesh hard.

Sides are now ready to be colored. If the mill is good size you can color the 25 sides at one operation.

Dissolve dye in boiling hot water. Add 8 pails of warm water to mill and put in skins; then add dye and run 30 minutes; rinse in warm water and horse up for three hours.

FAT-LIQUOR.

Fat-liquor with Palermo fig soap and egg yolk; use them in conjunction with each other in equal proportions. They impart a fine glossy finish to the leather and can be applied at 125 degrees of heat.

Horse up for 24 hours to drain; then slick hard on flesh with copper slicker and on grain lightly, and tack on boards. Remove from boards when dry and season with the following equal parts of frozen glue, Irish moss and flaxseed. After soft-boarding, apply the seasoning and then roll on glassing pack and then the leather is ready for market.

TANNING AND FINISHING HOGSKINS FOR BAG LEATHER.

After the skins are properly treated in the beamhouse, it is easy to turn them into desirable leather. For bag leather, hogskins may be tanned in bark or extract liquors, and from experience hemlock extract is the cheapest material to use. Start the skins in a weak liquor. A paddle vat is the best, as the skins are liable to tear in a drum. Strengthen the liquors twice a day, and run until the skins are struck through. This will take about eight days, in order to produce the right kind of leather.

BLEACHING.

After tanning, bleach them like collar and skirting leather, and drum in a sumac bath. Wash with clean water, slick out, give them a little oil and then dry. After drying, dampen and split or shave such skins as needed.

FAT-LIQUOR.

Now give a little fat-liquor, made from soap, degras and either neatsfoot or cod oil. Hog leather takes about half as much fat-liquor as calfskins. Dry and store away for a week or two. Moisten again

and clean the grain with borax and sulphuric acid. Mill a little in sumac again.

DYEING.

After being washed, the leather is ready for dyeing, which may be done by a drum or by brushing the dye over the leather. We hardly advise the latter, as the brushing is liable to get spotty and uneven. When the dye is well taken up, give a light coat of cod oil and dry. Then glaze and stake or board a little and the leather is finished. The leather should not be very soft.

Sometimes, when the skins are not perfectly free from grease before tanning, they will show dark, greasy spots, especially around the neck. It will then be necessary to give a milling in borax or soda; otherwise the leather will not be even in color.

COLORING AND FINISHING BROWN CASE AND STRAP LEATHER.

Here are some suggestions which may prove useful for coloring and finishing brown case and strap leather: Take six pounds borax and dissolve in half barrel of water, which should be heated until the borax is all dissolved. Put thirty sides of leather in mill with six buckets of water and run for five minutes, then pull plug and let water drain off. Now put the borax water into the mill, at about 110 degrees, and run some fifteen minutes, then let the borax water drain off. At once start mill again and put in twenty-five pails water and run for fifteen minutes. Pull plug and let the water out, then replace plug. Now take two quarts of sulphuric acid (oil of vitriol) and put into one-half barrel water, which should be at a temperature of 110 degrees. Start up mill and put in the acid solution, run fifteen minutes and drain off. Start mill again. Throw in twenty-five buckets of water and run for ten minutes, then withdraw the leather. Put two buckets Sicily sumac into about eight pails water and boil until it is about 130, and run leather in sumac liquor for about thirty minutes. Rinse the leather thoroughly, scour on grain side and it is ready for coloring.

FOR AN OLIVE COLOR.

For an olive color, take fourteen ounces of olive, one ounce of Y 9 and eleven-eighteenths ounce of neutral green. Dissolve each in separate pails, using three pails. Fill your paddle wheel two-thirds full of water, heat to about 110 degrees and put in fifty sides leather. Let paddle run five minutes, then take the olive dye and pour in, followed by the yellow, and lastly add your neutral green. Let run about thirty-five minutes or longer if necessary. Remove leather and rinse

well with water, then hang upon rack, take down and scour with a light coat of cod oil.

LIGHT AND SOFT LEATHER BEST FOR BAG AND CASE LEATHER.

For bag and case leather a soft tannage and a light color are necessary. The lighter and softer the leather is, the easier it is to work it out into suitable finished leather, and the better it takes the color.

If made from rough leather the stock should be first trimmed and then uniformly dampened for stoning out on the jacking machine. The leather is then skived and made ready for splitting on the belt knife machine. After splitting it is run in the drum in a borax solution and then in a sulphuric acid bath. The water should be warm and the quantity of borax used must be determined by the condition and color of the leather.

Today very little light-colored soft tanned rough leather can be found. Weight is a factor, since this stock is sold by the pound, and the more filling matter forced into tanned leather the darker and harder the grain.

The darker, dirtier and greasier the leather, the more borax is required. The leather is run in the warm borax solution for about twenty minutes, and then in the acid solution for fifteen minutes, then thoroughly rinsed in clean water and milled up in a sumac liquor. Four pounds of borax are sufficient for twenty-five sides of ordinary leather. The temperature of the borax water should be about 110 degrees Fahrenheit.

THE ACID BATH.

The acid bath is made by adding one quart of vitriol to enough water to mill the twenty-five sides. The sumac liquor should be as hot as can be comfortably borne by the hand, to which a little salt should be added. The leather is well rinsed after the acid treatment and then milled up in the sumac liquor for one-half hour. It is then rinsed off in clean warm water, struck out on the flesh side and scoured on the grain, and is ready for the color.

The scarcity of right colored rough leather tannages has forced many manufacturers of this class of goods to tan their own hides. For this class of goods clear grain green salted hides are necessary. They need to be well worked in the beamhouse, coming to the liquors free from all scud, short hairs and free from lime.

WATER FOR SOAKING.

The water used in soaking and deliming the hides is of great importance to the tanner, the quality of the finished goods depending in a great measure on the water used.

The hides on reaching the tanner are split down the backbone before placing in the soaks. To insure a straight line from butt to head a frame is built consisting of two uprights for ends, on which rest two boards with sufficient space between so that the knife in the hands of the workman can run easily and yet be guided by the straight edge. The hide is thrown across by two men, the line down the backbone straightened and the hide is cut into sides.

The hide is now trimmed by cutting away all useless parts and the trimmings are saved for the glue manufacturer.

After the hides are trimmed they are soaked for a day and then fleshed on the machine. After fleshing they are returned to a clean soak of running water and left until the next day. The sides now are hauled from the soak and toggled for the liming. Care must be taken that the sides go into the first lime in a smooth condition or the after reeling is hard and the hides do not lime uniformly.

OLD MELLOW LIME NECESSARY.

An old mellow lime is necessary on the start to insure a fine grain, followed by limes containing sulphide of sodium. Five to six days generally bring the hides in good condition for unhairing.

From the limes the hides should be placed in warm soft water of 100 degrees Fahrenheit and allowed to lie a few hours to take the harshness out of the grain, when they are ready for unhairing. If unhaired on the machine the sides need a good working out by hand over the beam to remove the short hairs, etc.

The unhaired sides now are well washed in the wheel and fleshed on the machine. They are now ready for the bate. For a bate, the excrement of the hen is mostly in use for killing the lime and softening the grain. After bating the sides are washed to free them from filth and drenched in a bate of lactic or boracic acid. The acid kills all remaining lime and brings the sides in good condition to the coloring liquors.

THE LIQUORS.

The green sides are tacked on sticks and suspended in the liquors. The first liquor should be weak, mellow and sour and about of 5 or 6 degrees strength. The harshness and also the pumping of the liquor can be helped by adding to the liquor a few pails of a rye flour solution which has been previously soured.

The rye flour solution not only makes a soft grain, but by its use full plump bellies and flanks are produced. The sides are shifted forward into stronger liquor every day or two until they are tanned and after being tanned are dried, made ready for the splitting and finished in the usual manner.

Sheepskins.

MOCHA CASTERS.

There are several kinds of mochas. The best for casters are known as blackheads. The skins should first be well soaked in clear cold water for 24 to 36 hours.

SOAKING AND LIMING.

They will soak more quickly in warm weather than in cold. When soft, cut them open, as they are usually pulled off without being cut. Then mill them well in a pinwheel to further soften and use plenty of water, as they are usually very dirty. Now put into clear white lime water. Do not use any arsenic or sulphide. The lime should not be too strong at first, but the skins should be well limed for say four to five weeks. They should be removed from the lime after two or three days and at intervals of four or five days.

UNHAIRING.

After being put two weeks in lime, start unhairing. Use about one and a half pails of unslaked lime to each 100 skins. Then frize. After frizing, put the skins in a little new lime water to raise the scud for a day or two. Great care should be used in scudding the skins, as poor work in this direction is often blamed on the finisher or colorer. The lime must be worked out of the skins if the best results in leather are desired. Wash in warm water and pure or drench.

Best results are obtained by using lactic acid. The proportion is one gallon of acid to 400 skins in 30 or 40 pails of water, about 75 degrees warm. Run in a pinwheel for one hour. Let drain a little, then tan with alum and salt, using three-quarters of a pound of alum and one-quarter pound of salt to each one dozen skins. Dissolve alum and salt together, making half pail of liquor for each one dozen skins. Mill for half an hour in pinwheel, then add one pail of good flour to each ten or twelve dozen skins and one quart of egg yolk. It is best to use fresh eggs. About three and one-half dozen eggs, yolks separated from whites, will make one quart.

Run the pinwheel a half hour longer, then withdraw skins, hang up to dry, and after drying lay away for a few days in a cool place. A little age improves leather of all kinds. Now dampen and mill up with a little flour, then knee stake, and if too damp, air off a little and finish on an emery wheel set with No. 120.

WASH AND GIVE EGG TREATMENT.

Now wash and give egg treatment. Use one pail of water to one dozen skins for washing, then give two quarts of egg yolk to twelve dozen skins. Dry again and stake as before, and finish by applying very fine No. 160 emery. The skins are now ready for sale as white. If sorted for colors and dyed, the skins, after drying, should be staked again and finished with the finest flour emery and are then ready for gloves.

TANNING OF SHEEPSKINS.

Since the pickled sheepskin has increased in value, fellmongers or wool-pullers have paid more attention to the slat. Formerly more attention was paid to the wool and the working of the slat was of secondary importance.

The advance made by tanners in their art of tanning and finishing sheepskin leather has made it possible to so closely imitate the high-cost leathers that only an expert can detect the difference between the genuine and the imitation when the goods are made up.

DRY SKINS GIVE TROUBLE.

In bringing the skins in proper condition to receive the depilatory very little trouble is encountered with green or dry salted skins. The dry flint skins are the ones which give the trouble. The skins have been dried in the open atmosphere and while drying the grease and gelatin have been made almost waterproof. To soften such skins many tanners depend on a putrid soak for the purpose. Others use chemicals in the soaks for cutting the grease and to swell the fiber. The use of a putrid soak on sheepskins oftentimes results in foul-smelling skins, the grease in the skins becoming rancid.

After a few days the skins are given a good breaking on the flesh side to break up the glace and then returned to the soaks. After being soaked the skins are washed in the machine to remove the dirt and what burrs there may be in the wool. The water is driven with considerable force against the wool side of the skin, leaving the wool in a fairly clean condition.

WOOL LOOSENED.

The skins are now, if well softened, put through the hydro-extractor to remove all water. This machine revolves at tremendous speed and the water is thrown out by centrifugal force. The skins are now ready to have the wool loosened for the pulling process, which is done either by sweating or by the use of depilatory.

Here in this country very little sweating of pelts to start the wool is done, but in many of the foreign countries it is carried out extensively.

DEPILATORY.

In using depilatory for painting wool skins the strength to be used depends largely on the class of goods to be pulled. Lime added to the mixture gives excellent results, leaving the wool clean and bright. The lime should be well slaked, taking care that all particles of lime are dissolved before adding it to the depilatory.

The skins are now placed smoothly on a table and the mixture applied evenly on the flesh side, taking care that only enough of the mixture is used to saturate it. The skins are now folded lengthwise, wool side out, and placed in a pile. In hot weather only a few should be placed in a pile. Four is plenty, and the room should be moist to prevent the edges of the skins from drying. The next day the skins should be in good condition for pulling and as fast as pulled they should be thrown into a clean water pit to prevent them from drying.

LIMING.

The skins are now ready for the liming, and for bright, clean looking leather they should go into a clean, weak lime, not an old, stinking one, as a good many of the old beamsters used to use. Sheepskins need a good liming to overcome the grease and plumper, and better leather is manufactured from skins which have been fairly high limed than from low limed stock. Since there is no hair or wool on the skins on going into the limes, the flesh side of the skin will show if the stock is properly limed. The flesh will be raised and will strip off easily when the stock is fleshed on the machine.

After the skins are limed they are trimmed over the beam and all useless parts thrown into the glue stock pile. They are next fleshed and made ready for drenching.

For a drench many still hang to the old bran drench, and then follow it by the lactic acid bath. After bating the skins are worked out and processed in salt and vitriol. After processing the skins are put in bundles of a dozen each and are ready for the tanner.

NOTES ON HANDLING SHEEPSKINS.

In a factory recently I saw a lot of finished sheepskins which were full of wrinkles on the necks, writes an experienced tanner. They could not by any possibility pass for No. 1 stock. The wrinkles would cause a waste of from a foot to a foot and a half on every skin. The foreman of the finishing department said that he had tried to remove these wrinkles by extra putting-out, but the slicker had no effect whatever on them.

The foreman said that he had thought the trouble might be in the coloring, but as the grain of the skins was not huffed that could not be the cause, and he had come to the conclusion that the wrinkles were in the skin when they left the sheep's back, and would always be there. I went down to the tanning room and saw the tanner putting his skins into the second bath without being struck out of the chrome. The necks were full of wrinkles where they had been carelessly horsed up out of the chrome bath. There was the trouble; the wrinkles being in the skin when they went into the second bath, were set in the tanning and nothing could remove them.

The proprietor of the factory was not a practical leather finisher. He knew when a skin was finished in good shape and where to sell it; but when stock came out wrong he was not always able to locate the trouble. He must depend largely on his tanner and foreman of the finishing room; still he did not allow them to have full control. It was easy to see that the labor of trying to put out these necks after being colored was thrown away, and was bringing up the cost of manufacture. Had the skins been struck out of the chrome before going into the second bath, they would have been all right.

In another factory I saw a lot of chrome tanned sheepskins that were poorly colored. Some were faded in spots, while in others the black had almost entirely disappeared. The foreman of the finishing room was trying to get them black by using logwood in his seasoning, but found that it would not penetrate the pores, and when dry would "smut" or rub off. After the skins were glazed the finish would "fly," or, in other words, would not hold. He was a man who had had years of experience in finishing skins, and was a good practical finisher but no tanner. He said he knew by the way those skins acted there was acid in them, and he had asked the tanner to wash it out more thoroughly, but the tanner had not done this, and the finisher was kept guessing all the time. It was another case where the proprietor depended on two foremen, one having charge of the tanning and the other of the finishing, and each blaming the other for being the cause of the trouble.

In all tannages a better finish can be produced if the skins are of a good color when leaving the coloring room, and it is most important

in the chrome tannage, as the skins can carry only a light seasoning. The pores of the skins are closed, and an excess of material would not only streak them, but come off where the skins were handled.

SPLITTING SHEEPSKINS.

After the pelts have been sufficiently limed, they are spread out flat in heaps for a day or two, which makes them firmer and easier to flesh. If packed down for a longer period, the heads, if containing meat, should be trimmed away on account of decomposition.

FOR HAND FLESHING FOR SPLITTING,

the piecing—that is, the trimming away of all useless parts, such as heads, shanks, tail pieces, etc.—is accomplished over a slanting beam before fleshing. To hold the skin from slipping under the knife of the workman, a piece of burlap is fastened to the edge of the upper part of the beam after the bolsters have been arranged.

The pelt is laid on the beam and by a downward stroke with the edge of the knife the flesh is pushed off. The pelt is now reversed and the other part done. The object is to get the edge of the knife in between the flesh and the veins. Care must be taken that the knife is not too sharp, so as to cut the pelt, and not too dull, whereby the pelts are strained and broken. The cutting edge for trimming or piecing is always kept sharp.

After the pelts have been pieced and fleshed they are spread down flat, care being taken that they are slicked out smoothly to remove all wrinkles and left to press for 24 hours before splitting.

In splitting it is found that the pelts from the fine wooled sheep have the coarsest texture, and the most open grains, and the fibers are loose. On the other hand, the pelts from the coarse-wooled sheep have the finest texture, the closest grain and the fibers are firm. Almost every breed of sheep show a different construction of fiber when split. The pelts from well fed animals will split differently from half-starved ones, also well limed pelts from under limed.

THE SPLITTING MACHINE

consists of a knife about five feet long, vibrating between a fixed bar and a flexible bar with springs attached. The skin is opened by drawing it between these two bars at the same time as the knife is vibrating, by means of a roller, with hooks attached. This splits the pelt into two pieces, the grain and flesher. The speed of the crank that moves the knife is about 1,200 revolutions a minute.

If the pelts have been well handled in the beamhouse and care has been taken in removing all wrinkles when packing down, it is possible to get two good pieces of leather out of one.

WORKING SHEEPSKINS.

In reference to grease spots in sheepskins showing up on the grain after the leather is tanned, it is due either to faulty beamhouse methods or to the manner in which the skins have been dried or cured.

In curing sheepskins by drying them exposed to the hot sun, the grease in the body of the skin is drawn to the surface, and on drying an oil tannage is formed. Such dried skins are always hard to soften in the soaks and on pulling the wool, the wool fails to start easily over these greasy spots.

CAUSE OF SPOTTED SKINS.

Slats on which the wool has been started by the use of sulphide of sodium has the grease left in them in the form of a soap, and if the skin is allowed to lie around exposed to the air after being pulled, a soap tannage is formed which will give spotted skins.

Since the chrome tannage has come into general use, many tanners of pickled or processed skins have had considerable trouble in the working of different lots of skins; both in the tanning and finishing. One invoice may work fairly well and the next, although of the same brand, come out far different in appearance.

Very few tanners of pickled sheepskins understand pulling wool and liming the slat. It is, in most instances, a separate business, and very few concerns pull the wool, lime the slat, and tan and finish the skin.

Wool pullers who sell the skins in the pickle are not tanners, neither do they know that certain tannages work different from others on pickled stock. Two tanners may work in a pullers skins; one may tan in vegetable tannages and make a good job; the other use chrome tannage and fail to get satisfactory results.

SOAP TANNAGE IN SKIN INJURIOUS.

Pelts which have had the wool started by the use of depilatory need a higher liming and more labor put out on them over the beam than do skins which have been sweated. In sweating skins to start the wool a large amount of grease leaves the pelt and goes into the wool. In starting the wool by the use of sulphide of sodium the grease remains in the skin in the form of a soap, and if not worked out in the beamhouse, the tanner's troubles start here and he is bothered all through the work. A soap tannage in a skin works against either the chrome or a vegetable tannage. This has been proven to tanners who have tried to force tannic acid into skins which have first undergone the Napa tannage. The skins would be spotted, even after prolonged milling in the drum in hemlock extract liquor. The same thing takes

place if the soapy solution caused by the action of sulphide of sodium is not worked out of skins before starting in to tan them.

REMEDY FOR TROUBLE WITH PICKLED SKINS.

A tanner who is having trouble with his pickled skins can find a remedy by working the skins over the beam himself. To get the skins in a proper condition for working they must first be given a good milling in a solution of warm water, salt, whiting and borax. This will kill the acid and the skins will be soft and in condition to go into a sour bran drench for a few hours. The action of the bran drench will soften the soapy solution made hard by the salt and vitriol when processed, and when the skins are worked out over the beam, the knife in the hands of the workman will work out all loose, soapy matter.

It is an old saying, and a true one, that leather is made in the beam-house. The more filth and scud worked out of hides and skins, the more open the green stock and the easier the tanning and finishing is carried out.

TREATMENT OF SHEEPSKINS FOR MAKING SPANISH LEATHER.

The first operation and one of the most important in the tanning of sheepskins is the soaking. If the skins, when they come to the tanner, have been heavily salted, it requires more time to soak them; if they are not heavily salted or very dirty, it only takes a few hours to remove the salt and dirt. In warm weather, when the water is warm, great care should be taken not to soak too long; in cold weather they can be soaked twice as long without injury, but be sure that all the salt is removed if you desire a clear grain. After the soaking process is completed the pelts should be allowed to drain and all the surplus water removed.

SECOND OPERATION.

Now follows the wool pulling. The pelts are painted with a solution of sulphide of sodium and lime. Make the sulphide of sodium liquor eighteen to twenty degrees Baumé test and add six three-gallon pails of slacked lime. The sulphide of sodium and lime should be like thin paste; apply to skins when it is cool. The painting is done with a brush and only enough is put on to cover the skin. Care should be taken not to have any of the solution come next to the wool. Work should be done in a cool room, and don't pile the skins more than two together. The wool will start in a few hours, but don't pull until next day, except very young lambs, which should be pulled as soon as the wool can be started easily. After pulling the pelts should

be at once put into clear, cold water, into which has been added some sulphide of sodium. The skins may be kept in this until they are free from dirt and fine hairs.

LIMING PROCESS.

For a new lime take six gallons of lime and slack in twenty gallons of water. This will answer for about three hundred skins, medium size; pour this into the lime vat and enter skins for one day, then haul out and add three gallons of lime, slacked in fifteen gallons of water, and enter skins for another day. Then haul out and strengthen lime, and enter skins. Keep this hauling out and strengthening up for six days for medium thick skins. It may take longer at some seasons of the year.

DRENCHING.

Remove the skins from the lime and wash in warm water, then put in a vat with water enough to drench them, heated to ninety degrees. Add pure lactic acid, one-half gallon to every fifty gallons of water. If there is an excess of lime in the skins, use more acid. If they are free from lime, use less acid. Keep the skins in motion while in the drench, which will take from one to three hours. After this work the skins on the beam or slating machine.

PICKLING.

Take 3 quarts of sulphuric acid, 75 pounds of salt, for 150 medium skins, with water enough to cover them; enter skins and stir them. They should remain in this pickle from two to three hours.

DRENCH TO REMOVE PICKLE.

Take 2 pounds of whiting and 5 pounds of salt for 100 pounds of skins, dissolve whiting and salt in 8 gallons of water, put in drum and run 15 minutes. Let the skins lay in this liquor 25 minutes, then wash thoroughly with warm salt water; then after they are drained they are ready to be tanned.

TANNING.

Take 6 pounds alum, 3 pounds Glauber salts, 4 pounds common salt. Dissolve together in 10 gallons soft water.

Take 5 pounds ground sumac, 3 pounds oak bark, 1 pound nutgalls, 4 ounces sulphuric acid. Add the sumac, nutgalls and oak bark; boil 20 minutes, then strain while it is hot; then add sulphuric acid and stir well.

Drum the skins for one hour in this liquor blood warm and then allow them to drain for 24 hours. Then oil them with neatsfoot oil on

both sides. Then hang up in warm room. This leather will not absorb moisture and is used as automobile coats, as well as for furniture upholstering. If smooth surface is required, the skins should be struck out hard on both sides before the oil is applied, and while it is drying it should be worked continually until the skins are dry and soft.

Dye to be applied with brush or swab.

WINE COLOR.

Ox blood shade: One ounce amaranth, 3R.

CHOCOLATE BROWN.

Two ounces chocolate brown, 270.

FINE SHADE OF GREEN.

Three ounces dark green, M.
One ounce amaranth, 2-R.

TANNING SHEEPSKINS AND SHEARLINGS WITH CHROME LIQUORS.

To get good results it is best to start at the soaks. If the shearlings are dry they should be soaked in salt water for 24 hours, then milled for half an hour and returned to the soaks for 24 hours. They are then fleshed and resoaked for 12 hours. Fresh shearlings are better if soaked in salt water, as the wool will be less liable to slip. After the skins are fleshed they are pickled thus in a paddle wheel: To each dozen skins use 20 pounds salt and 1½ barrels sulphuric acid. (Much better results can be obtained by having enough skins to make a paddle tub well filled than by having a few skins in a large amount of water.) Dissolve the salt first and then add the acid and enter the skins. Run the paddle one hour and allow the skins to rest in the paddle over night. The next day pile the skins on the floor, flesh to flesh, for 24 hours.

TWO-BATH PROCESS.

To tan with the two-bath process use three to four pounds of bichromate of potash, two pounds muriatic acid, 12 gallons water to each dozen skins. Run in a pinmill two and one-half to three hours, then pile down for 24 hours. The second bath is prepared as follows: Dissolve 16 pounds hypersulphite of soda in 15 gallons water and allow to cool; put the skins into the mill and then the hypo-solution. Start the mill and then take three pounds of muriatic acid and stir it into a pail of water. Add it to the mill of skins through the gudgeon and

run until the skins are turned blue. Cut into the neck of a skin to see if they are blue clear through. When tanned they are washed for one and one-half hours. They are then ready to receive the grease.

ONE-BATH PROCESS.

To use the one-bath tannage the skins are pickled the same as for two-bath. After they are piled down 24 hours make up a salt water liquor in a paddle wheel as follows: Fifteen pounds of salt to each one dozen skins; put in the pickled skins and run the paddle one hour. The skins are then ready to receive the tan liquor, which should be added to the skin in four portions. It will take at least 48 hours to tan this way in the paddle wheel. If tanned with one bath in a pin mill, it will take about eight hours. The amount of tan liquor to use depends on how strong the liquor is. The one-bath liquor can be purchased, as it is more uniform and costs less than it can be made. Use eight pounds of tan liquor to each one dozen of skins. After they are tanned they are piled down flesh to flesh for 24 hours. They are then washed for one hour in clean cold water.

PASTE.

Now make up a paste as follows: Ten gallons water, three pounds olive oil soap; boil until dissolved, then add one gallon neatsfoot oil and boil half an hour. Allow to cool to 85 degrees, then stir in flour until the paste is just thick enough to spread smoothly. After the skins are washed they are allowed to drain over night, and the next day give each skin a coat of paste and hang up until dry. When dry stake and put into a dry mill and run the mill two hours. They are then ready to ship.

COLORING.

If the wool is to be colored, the coloring should be done after the skins are washed. Aniline dye is the best to use, as it can be used hot and will give the cleanest color. One bath will make the best white wool skins. Two baths will leave the wool a pearl white.

TANNING WOOL SKINS.

Wool or hair skins tanned in the ordinary manner in vegetable tanning liquors usually require too much time, and the more time required the coarser the hair is apt to become. By giving the skins an alum tannage first, the hide substance will be prepared to absorb the vegetable tannage very rapidly. The alum tannage composed of a mixture of two parts alum and one part salt may be rubbed in on the flesh side and after this is done the skins are laid in packs for 24 hours, during

which time they are moved twice. The tannage will all be absorbed by this time and another coat is applied. After from 6 to 12 hours the alum tannage will be complete. The skins are next washed lightly, allowed to drip and are ready for the tannage proper. The tanning liquors will now penetrate very easily and the leather which results will be soft and pliable. The appearance of wool skins naturally suffers a little disadvantage through the vegetable tannage, but the advantage of the combination, as described here, will be seen to a marked extent on the skins.

MAKING CHROME-TANNED SHEEP FOR GLAZED SHOE LEATHER.

The pickled skins are first pressed or put through a wringer to remove all the grease pissible. They are then put into a pinmill with a warm salt water solution, using 8 to 10 pounds salt and 10 to 12 gallons water to each dozen medium sized skins. Have solution at 85 degrees Fahr., run half hour, then drain off all the salt liquor from the mill.

Now make up a solution of sulphate of alumina and sal soda as follows: For each dozen skins dissolve 3 pounds of sulphate of alumina by boiling in 3 gallons of water; in another tub or barrel dissolve 3 pounds sal soda in 3 gallons boiling water. When both are dissolved pour the dissolved sal soda into the alumina solution very slowly and stir well. When it is thoroughly mixed add cold water to cool it down to 80 degrees Fahr. Put this solution in the mill with the skins, and run them one-half hour.

TAN LIQUOR FORMULA.

They are then ready to receive the tan liquor. If two-bath leather is preferred, the following formula will give very good results: For first bath, use 2½ pounds bichromate potash, 5 pounds salt, ½ pound sulphuric acid. Run skins in first bath two hours, then horse up twenty-four hours. They are then ready for the second bath, which is as follows: 10 pounds hyposulphite of soda, 1 pound sulphuric acid. Run skins in second bath wash two hours; they are then ready to wash and shave.

Some tanners run them on a fleshing machine after washing, and do not shave, as it is less expensive and answers the purpose of shaving. After shaving they are put back into the mill and given a retan of gambier, using 2 pounds gambier in 6 gallons water, and run one-half hour.

STAINING.

They are then stained as follows: For each dozen use ½ pound logwood crystals, 2 ounces extract fustic, 6 gallons water; run one-

half hour, then give the striker, made of 1 ounce copperas, ½ ounce bluestone, and run ten minutes.

FAT-LIQUORING.

They are now washed for fifteen minutes in clean water, when they will be ready for fat liquor with the following fat liquor: ½ pound fig soap, 1 pound treated cod oil, boiled one-half hour; use at 140 degrees Fahr.; run in fat liquor one-half hour, then horse up over night; in the morning set out and oil off very light on the grain with seteen oil. They are then hung up to dry. When dry they are dipped in hot water, rolled up into bundles of four skins each, then packed into a box for twenty-four hours. They are then staked, well tacked out on boards, and left until dry. Now trim and give a coat of season, dry and glaze; then another coat of season, dry and glaze. Now oil off with a light coat of finishing oil.

ONE-BATH TANNAGE.

If one-bath tannage is preferred, they are handled just the same until the time they are tanned. There are one-bath tan liquors on the market that can be bought, and directions for using the liquors are furnished by the firms selling them. After they are tanned they are handled just the same as if tanned with two-bath liquor. These instructions are all based on one dozen medium sized skins. If skins run large or small, the amount of material used must be varied accordingly.

PULLING WOOL FROM SKINS AND PICKLING THEM FOR MARKET.

Soak skins and flesh clean. Make up a paint as follows: Slake twenty-five pounds of lime and use just enough water to cover it. Dissolve twenty-five pounds of sulphide of soda in ten gallons of water. Mix the lime and sulphide solution together and paint the flesh side of skins and fold the skins together, flesh in. Lay in a cool place for twenty-four to thirty-six hours, when the wool can easily be pulled and washed in clean cold water. The skins are washed to remove the sulphide paint and then placed in a weak lime for two days. They are then washed again and bated in a bran bate and pickled as follows: For each dozen of skins use three-quarters pound of sulphuric acid, eight pounds of salt, ten gallons of water; leave skins in pickle twelve hours. They are then piled down in smooth piles for forty-eight hours, when they will be ready for market.

BLACK DYED SHEEPSKINS.

After the skins are tanned scour the wool well with strong soap suds so as to remove all the grease from the wool, then rinse off well so that no soap is left in the wool and let drain for half hour or so. Then proceed to dye. This is a three-bath dye. Use the mordant first in a sweet condition. Then the set. Then the mordant in a stronger solution. Use as a mordant first bath ½ pound bichromate of potash, dissolved in 10 gallons of water, at about 100 degrees heat. Double the skins flesh side in, and immerse as in any other kind of dye. Then let drain, then dip in the set strong logwood liquor with about 1 pint of spirits of ammonia to 10 gallons of liquor, at about 120 degrees of heat. Let drain, then give the last bath of bichromate of potash. For this last use 1 pound of the potash to 10 gallons of water, or double the amount used in the first bath. Heat to 120 degrees. Immerse the skins well; then let drain for about one hour. The water used in all the baths should be soft rain water if possible. After the skin is well drained rub some kerosene oil in the wool, which will set the dye permanent. Let the skins lay or drain about one hour longer. Then rinse off, clean and proceed to dye as with other dyes.

The amount of potash here given may not be just the quantities, as it is some years since I have used the process, but if my memory serves me right this is about the quantities used. The dyer can try it on a small piece of skin as an experiment, and change the quantities to suit himself. The color should be jet and permanent.

PICKLED SHEEPSKINS.

In using the one-bath tannage on sheepskins which have been pickled or processed, as it is usually called, the best results are obtained by freeing the skins of the process. In all the one-bath tannages the inventor says we should give the skins a slight tanning in salt and alum. Now, alum tanners found out years ago that alum used on processed skins did not give satisfactory results unless the process was first removed.

WHITING TO REMOVE PROCESS.

For the purpose of removing the process whiting is used. This acts as a drench. After the skins have been pressed and milled, place the pack in a tub containing the whiting and salt, to which solution a little borax or soda has been added. Sufficient water should be used to allow the skins to move about freely. Let them come to the top of the solution twice and then free the skins from the whiting by washing them in clean water. The soda or borax helps to kill the vitriol and also lessen the danger of buffing the grain. Besides remov-

ing the process this drenching also helps to free the skins from any lime and dirt that may have been left in them through improper beamhouse work.

After the skins are washed free from whiting they are milled in a solution of sulphate of alumina, salt and flour, and after the solution has been well drummed into the skins they are taken from the drum and horsed for a day or two to allow the green stock to draw.

The skins now are given the one-bath chrome liquor in the paddle wheel or drum, and after the liquor has penetrated all parts of the skin they are taken from the drum, horsed for a number of hours, washed to free them from acid and then colored.

VALUE OF AGING THE STOCK.

It is a good idea to have a sufficient number of skins tanned and colored ahead so that after being dried from the black they can be packed down for at least two or three weeks. This aging of stock is very beneficial whether the skins have been tawed or vegetable tanned. The old alum tanners never thought of finishing a skin unless it had lain some six months in the crust, and if their capital had allowed it the skins would have remained in the crust two years. One foreman, who personally tans the output of the factory, consisting of pickled sheepskins tanned by the chrome process, found that the longer the skins could lie after being tanned and colored the easier they would work. He learned this through the factory being shut down some four or five weeks for repairs. The skins that were colored ahead had this length of time to age. This foreman claims the black is not affected in any way as is leather that has been tanned in the vegetable tannages and left lying in the black.

Vegetable tanned stock, after being colored, should be finished as soon as possible after it has become dry. If, perchance, through a dull wet spell the drying is prolonged the black rapidly fades. The time when vegetable tanned stock improves is when lying in the rough tanned state. Many tanners of bark tanned sheepskins who have sent their skins to commission houses to be sold in the rough were surprised to find after a few months that the skins improved much in appearance and mellowness.

DRY SLATS.

WORKING IN THE BEAMHOUSE.

In some factories where they work through the beamhouse dry slats for sheepskin leather the foreman seems to think all that is necessary is to remove the short hairy wool and the skin is ready for tanning. Instead of placing the slats in the limes after soaking

and liming them for six to eight days, and then, after the beamwork has been done, putting them into a bran drench, they are placed in a pinwheel; a solution of sulphide of sodium is thrown in; the skins are thoroughly milled in this solution and then left until the next morning. In the morning they are given a good washing in warm water to remove the hairy wool, which has been reduced to a pulp by the action of the sulphide. The skins are then fleshed, put back into the mill, given the second washing, and, after being drained, are tanned.

SWEATING SKINS.

This method of working dry slats might do on light weight dry slats from which the wool has been removed by sweating. In sweating skins to start the wool a large amount of grease leaves the pelt and goes into the wool, but on skins which have had the wool started by the use of sulphide of sodium it is the opposite. In starting the wool by the use of sulphide of sodium the grease remains in the slat in the form of soap and if not worked out of the skins in the beamhouse the soap works against the tanner. There is good evidence that for any tannage woolskins that have been pulled by the painting process need higher liming and more work put on them in the beamhouse than do sweated skins.

SKINS SHOULD BE WELL FLESHED.

Skins with lumps of fat on the flesh side should be well fleshed before painting with the sulphide. Then, again, as soon as the skins have been pulled they should be thrown into water pits to save them from drying. The grease contained in a sheepskin retards the tanning and the surplus grease must be removed before starting in to tan it. In the liming process a large amount of grease is killed, and, if well worked through the drench and over the beams, all the surface grease is worked out. To rid the skins of the remaining grease they should be wrung through warm water by a wringer or else processed and pressed under a hydraulic press.

DRY FLINT SHEEPSKINS.

One of the raw materials which needs careful working in the beamhouse is dry flint sheepskin. Green salted and dry salted skins give but little trouble, their fibers being in a far different condition.

In the flint dried skin the connecting tissues are often in such a condition as to make it almost impossible to bring the skin back to anything like its natural state in the soaking process. Many tanners depend on putrid, foul soaks for this class of work, trusting to the liming and tanning process to overcome the odor of rancid grease.

While the putrid, dirty soak is quick in its action it should never be used on sheepskins, since it causes the grease in the skin to become rancid and the finished leather to have a disagreeable smell. The grain of the skin is also made dingy to such an extent that it cannot be made white and clean by the processing. This injures the stock for white alums and the delicate shade of fancy colors.

CLEAN WATER FOR SOAKING.

The soaks in a beamhouse should be so built that the water can be run off and the filth cleaned from the sides and bottom. Clean water, to which chemicals of a softening nature are added, should be used for the soaking. Various chemicals, such as borax, caustic soda and sulphide of sodium are used to good advantage, the skins being soaked back to their natural condition without pricking the grain or injuring the fibers of the skin.

In many of the old-fashioned tanneries the beamhouse was built handy to a stream of water so that there could be an inflow of water without pumping, and the soaks were so built that they could not be run off. It is impossible to keep such soaks clean, the only way that they can be partially cleaned out being to skim out as much hair and dirt as possible by the use of the skimmer.

LIMES SHOULD BE KEPT CLEAN.

In liming the limes should be kept clean, and if the skins are full of grease the lime liquor should be of good strength, since considerable alkali is needed to overcome the grease. Here is one of the most important points in the manufacture of sheepskin leather, since there is a vast difference in the amount of grease in different lots of sheepskins, and the degree of strength in a lime which would be right for one lot would be wrong for another.

There is no question of doubt that tanners of sheepskins who buy pickled stock tell the truth when they say that no two wool pullers work their skins alike, and that the same brands worked through the beamhouse by different men tan and finish different. This is more noticeable in the chrome tannage than in any of the others, for, if the skins are limed too high, the finished leather is loose and spongy, and if low limed the grease works against the chrome.

BATING.

In drenching the skins to kill the lime a bate made from bran or lactic acid is used. If the skins are to be tanned in chrome the lactic acid bate works well, since by its use the skins are not reduced as much as when drenched by the use of bran or other bacterial bates.

After being drenched the skins should be washed in warm water and after draining be processed in salt and vitriol.

There is considerable grease left in sheepskins after the liming process, and to rid the skins of this remaining grease, pressing under a hydraulic press is resorted to.

TANNING BY CHROME PROCESS.

In tanning the skins by the chrome process, if too much acid is used the skin is swollen beyond its normal capacity and its connecting fibers weakened. The skin may be brought back so as to appear natural, but the damage is done and will show itself again when the skins have reached the finishing room. The grain having been once separated from the flesh is again loosened by the softening process the skin is obliged to undergo in the finishing. When the skins are in this condition the agate or glass cannot slip over the grain without dragging wherever it strikes. To cover up the looseness of grain, and to insure against the skin dragging over when glacéd, finishers roll the skin on the grain while it is damp from the seasoning under the roller of a rolling machine.

MANUFACTURE OF CHROME-TANNED SHEEP LEATHERS.

Large quantities of sheepskins are tanned by chrome processes at the present time. They are colored and finished in a great many ways, according to the purposes for which they are to be used. In order for the tanner of this class of leather to produce good salable stock it is necessary for him to thoroughly understand and carefully carry out every detail of the various processes through which the skins are worked. Seemingly trifling details are often the items of the most importance. Hence in this article the processes are minutely described, since no detail is unimportant and upon the careful attention to minor points depends the success of the entire process. The methods of working the skins are all practical and are in use at the present time. While they relate especially to sheep and lambskins, the tanners of other skins will find many ideas and suggestions that will be of value to them in their work.

SHEEP AND LAMBSKINS FOR GLOVES, SHOES, ETC.

Sheep and lambskins are used for glove, shoe and sundry other urposes. After they are tanned they are colored and finished as may be desired, usually in imitation of higher-priced leather. The skins are tanned in both one-bath and two-bath processes. Sheepskins are

naturally full of grease, and before they are tanned with a chrome process it is necessary that as much of the grease as possible be removed from them. During the beamhouse work the skins are pressed directly after the liming process is completed. In the case of pickled skins, they are first drummed up in salt water to soften them out and are then pressed, or they are first pressed and then softened in salt water.

PRESSING AND WRINGING

are the two methods in most common use, the former being generally preferred to the latter, as it is the more effectual. Skins that are to be finished into shoe leather or given a glazed finish require a very thorough degreasing in order that as much grease as possible may be removed, as grease left in them prevents the getting of a clear and bright finish. It is also a nuisance when the skins are being colored fancy shades. In some instances the skins are treated to a naphtha process. Other methods might be used, but as a rule they not only remove the grease but take out much of the life of the skins as well.

REMOVING THE ACID FROM PICKLED SKINS.

A very satisfactory method of tanning pickled sheepskins with one-bath chrome liquors consists of the skins being first tawed with sulphate of alumina or alum and salt. This way of tanning makes the skins of plump body and smooth, fine grain. When this process is used it is necessary to remove the acid from the skins before they are given the alum and salt. When the acid is not removed or neutralized the tanned leather dries out hard and papery and lacking in softness and strength. The acid may be removed in several ways. One-bath chrome liquors are not all alike and on account of this the methods of preparing the skins for one liquor do not work right when another is used. A common method of drenching the pickled skins is by the use of a solution of whiting and salt. For some processes this is all that is required, while for others it must be followed by a light drenching in a bath of sour bran, water and salt. The bran drench may be used alone without the whiting and salt.

SALT ABSOLUTELY NECESSARY IN DRENCH.

Salt is absolutely necessary in the drench to hold the skins from swelling. Before the skins are drenched they should be pressed and then drummed up in salt water. The temperature of the drench should be about 90 degrees Fahrenheit. For 100 pounds of skins about 500 pounds of salt and 2 pounds of bolted whiting should be used in 12 gallons of water. The skins are run in this liquor in a drum for thirty minutes and then allowed to rest in the liquor for a quarter of an hour.

A few ounces of sal soda may be added to the liquor. After the skins have been drenched as described with the whiting and salt they should be placed into a light sour bran drench for one-half hour, to which enough salt has been added to keep the skins from swelling, after which they may be washed in warm salt water and are then ready for tanning. They should be always perfectly free of all the whiting or they will be brittle after tanning and drying out. The whiting and salt drench gives the skins an alkaline character, which in some processes of tanning causes the skins to tan too rapidly upon the surface, causing the grain to become rough and coarse. The object of the second bath of bran and salt overcomes this tendency and produces skins of a smooth, fine grain. The whiting may be dispensed with entirely and the bran drench used alone as has been already suggested.

Another very good way to get rid of the acid in the skins is by the use of a prepared bate made from coal tar. This material can be bought ready for use and requires simply to be dissolved in warm water. Used as a drench it serves to remove the acid and also some of the surface grease, which is a desirable thing to be accomplished, especially if the leather is to receive a glazed finish.

WAY TO USE THE BATE.

The way to use the bate is as follows: For five dozen skins of medium size about twenty-five gallons of water are run into a tub or vat and heated to 90 degrees. In about one gallon of warm water is dissolved one pound of sal soda, and in another gallon of warm water two pounds of the bating material are dissolved. One-half of the bate solution and all of the soda solution are added to the water, and the liquor is then stirred for a few minutes, and then the other half of the bate solution is added and the liquor is then ready to be used.

The skins after being pressed and drummed in salt water are placed in the prepared drench one at a time and well opened out. They are stirred about in the drench for about ten minutes, and at the end of this time the pickle is removed and the skins may then be taken out and allowed to press and drain for some time before they are tanned. Before the skins are drenched they should be sorted according to thickness into three grades—light, medium and heavy—and the time consumed in the drenching and tanning of them will be determined largely by their thickness, more time being required by heavy skins than by light ones.

COMBINATION OF ALUM AND CHROME.

Very good leather that can be finished into either shoe or glove leather is made by applying a one-bath chrome liquor to a skin that has been tawed with alum or sulphate of alumina. After the drenching and draining, the skins are drummed in a solution of sulphate of

alumina and salt. The usual formula is for each 100 pounds of skins, weighed after draining, three pounds of sulphate of alumina and six pounds of common salt. Glauber salt also may be used in quantity about four pounds to each hundred weight of skins. The articles mentioned are dissolved in about ten gallons of warm water, and the solution is placed in a drum with the skins and the drum is run from one-half to three-quarters of an hour, until the skins have acquired smoothness of grain and plumpness. Although the sulphate of alumina is a tanning agent, it does not act as one when it is used in this way, as it is all washed out before the leather is dried out. The material does not tan the skins until it is dried in. Alum may be used in place of sulphate of alumina.

PLUMPING.

The objects of using either of these articles are to plump the skins somewhat and to prevent any contraction of the fibers or drawing of the grain. When there is no hurry for the leather the skins may be taken after the drumming in sulphate of alumina and salt and thrown in a pile or over horses and allowed to press and drain for as long a time as is possible. They may also be taken, hung up and dried out, and after drying be allowed to lie some time before they are given the chrome process. The longer they are left in the dry condition, the better is the finished leather. When they are to be tanned they are washed back in a drum until every spot is moist and soft; then they are given the chrome liquor.

SOLUTION OF TANNING LIQUOR.

This may all be dispensed with, however, and the tanning completed in one operation without removing the skins from the drum. Two or three hours completes the process. After the skins have been drumming in the solution of sulphate of alumina and salt for three-quarters of an hour, a solution of the tanning material is prepared, consisting of, for each 100 pounds of skins in the drum, three gallons of the concentrated tanning liquor mixed with three gallons of soft water.

This solution is divided into three portions, one of which is added to the contents of the drum and the skins drummed for thirty minutes, then a second portion is added and the stock drummed for one hour, then the third and last portion is added and the drum is run for another hour, at the end of which time the skins will be found to be tanned through. This can be ascertained by the tanner by cutting into the thickest part of the heaviest skin, and if the green liquor has penetrated every fiber the skins are tanned. The skins should be allowed to lie in the liquor over night, in order to give the chrome salts taken up by them time to act or to take full effect upon the fibers, and thus to completely convert them into leather.

The following morning the tanned skins are removed from the drum and are washed. The washing is very important and should never be slighted. The first water should contain preferably one-half pound of borax for each 100 pounds of leather. In this water the skins are washed for at least fifteen minutes, after which it is necessary to again wash them for another fifteen minutes in clean, cold water. The leather is then ready for the operation of coloring and finishing.

COLORING AND FINISHING.

The use of the alumina and salt is not necessary, as very good leather can be made without them. When they are not used the skins are taken after drenching, placed in a drum with about five pounds of salt for each hundred weight of skins and drummed in the same for fifteen minutes. Then the chrome liquor is given to the skins, a portion at a time, until three gallons have been used, and the drumming is continued for from two to three hours, according to the thickness of the skins, after which the skins are washed as above described. This is a very simple and cheap way to tan the skins. The skins may also be made into very soft, tough leather by the following process: For each 100 pounds of skins ready for tanning five pounds of alum, ten pounds of salt, ten pounds of flour and ten pounds of eggyolk (or, in place of this quantity of eggyolk, five pints of eggyolk and two and one-half pints of neatsfoot or olive oil) are made into a thin liquid paste with warm water. This paste is put into the drum with the skins and the drum is run for one hour, or until the paste has been freely absorbed by the skins. The skins are then hung up and dried out and stored away to be cured. The longer they are stored before they are finished the better it is for the quality of the leather. Skins treated in this manner may be finished up into very nice leather without further tanning. When chrome leather is wanted they should be uniformly moistened back with warm water in a drum and then retanned with a one-bath chrome liquor. No fat-liquoring after the retanning is required, as the oil and eggyolk make the skins very soft and tough. The flour helps to fill and plump the leather.

TANNING THE SKINS IN PADDLE-VATS.

Sheep and lambskins are very satisfactorily tanned with one-bath chrome liquor in vats. When the skins are tanned in this way they may first be pickled in a solution of sulphate of alumina or alum and salt, or they may be tanned directly after being drenched from the pickle. The skins are started in a comparatively weak liquor, one made up of two or three gallons of tanning liquor and a few pounds of salt in 100 gallons of water. As the skins absorb the tanning material from the liquor more chrome liquor should be added until about six gallons of the same have been added to 100 gallons of water. Soft

water should always be used, as hard water containing lime and magnesia causes a precipitation of the tanning material, rendering the liquor unfit for use. Salt in the liquor keeps the skins open and plump and receptive to the tanning material and hastens the process as well as helping to make soft leather. The time consumed by this form of tanning ranges from twenty-four hours upward, according to the strength of the liquor and thickness of the skins. It is important that every skin is tanned thoroughly before it is taken from the liquor. When one lot of skins is tanned, another may be put into the liquor, and in this way the cost of tanning is kept at a low figure.

TANNING IN TWO-BATH PROCESSES.

When pickled sheepskins are to be tanned by a two-bath or acid process the best results follow when the skins are drenched before they are tanned and thus put into a perfectly neutral condition. The removal of the acid is easily accomplished by the use of whiting and salt. The most commonly used process of acid tanning is carried out substantially in the following manner: After the pickle has been removed from the skins, and they are in neutral condition so far as acid is concerned, they are placed in a drum, and for each hundred pounds of skins a bath is prepared, consisting of five pounds of bichromate of potash and two and one-half pounds of muriatic acid in sufficient water to enable the skins to work nicely, say ten or twelve gallons. This solution, to which some salt is added, is given gradually to the skins in the drum until all is in and the skins are then run in the liquor until the yellow liquor has penetrated through the thickest part of the heaviest skins. This is usually accomplished in less than one hour, depending upon the thickness of the skins. When too much acid is used and the proper proportions are not kept up, the skins swell up in the liquor. The salt has the good effect of preventing undue swelling. The quantities of bichromate of potash and acid may be varied somewhat. Sometimes four pounds of the former and two pounds of the latter are sufficient.

FIRST BATH.

When chromic acid is used, four or five pounds are required by each hundred pounds of skins, without the addition of muriatic acid. The important point in the first bath is to get the skins thoroughly penetrated with the yellow chrome liquor before they are taken from the drum. Carelessness in this respect results in poor leather. After the skins are removed from the drum they should be placed in piles and covered up until the next day. They should not be exposed to the air or the sunshine and not allowed to dry out upon the edges. The chromic acid taken up by the skins continues doing its work while the skins are draining, and much better leather results than when the

skins are placed at once into the second or reducing bath. The surplus liquor should be removed from the skins by striking them out or by pressing them. The former method is the best for sheepskins, as it serves to remove the wrinkles, which, when they are left in, become fixed in the second bath and not readily removed later.

SECOND BATH.

For the second bath a paddle vat is undoubtedly the best to use. This bath consists of a solution of hyposulphite of soda, muriatic acid and water. Before the skins are put into this liquor they should be dipped singly into a weak solution of hyposulphite of soda and acid, as by this means a slight reduction of the chromic acid upon the surface of the skins is accomplished. Enough water to enable the skins to float and turn in the liquor is run into the vat, and for each hundred pounds of skins from twelve to fifteen pounds of hyposulphite of soda are dissolved and poured into the vat. To this is added three pounds of muriatic acid. The addition of the acid causes the formation of sulphurous acid, which is the active agent in the bath. By means of the paddles on the vat the skins are kept in motion and a uniform tannage results. It usually requires from ten to eighteen hours to complete the process, thick skins, of course, requiring more time than thin ones. The skins should be left in the second liquor until the yellow liquor has entirely disappeared and the skins have assumed a uniform greenish-blue color. The change of color should be through the thickest skin before they are taken from the liquor. This completes the tanning.

There are several other methods of tanning the skins in acid process. They all require careful preparation. After the skins are tanned they must be very thoroughly washed in order to get rid of all the acid. This washing in a two-bath process is even more important than in a one-bath process, because of the corrosive nature of the acids which, when they are left in the leather, cause the fibers to become weak and the leather to break and crack at the slightest strain.

FINISHING CHROME-TANNED SHEEPSKINS INTO GLOVE AND SHOE LEATHER.

For black shoe leather, the skins may be treated in the following manner: After the washing is completed the skins should be struck out on a machine or pressed, thereby removing as much of the surplus water as possible, and then shaved, remembering during the shaving to protect the skins from stain or grease. The grain of the skins may be cleared of greasy matter by drumming the skins for fifteen minutes in a solution of lactic acid and water—about one gal-

lon of the acid mixed with fifty gallons of warm water—and then washing them off before coloring them. They are then stained with logwood liquor, to which a small quantity of black aniline in solution and a little ammonia are added. This serves to stain the flesh a bluish purple and gives a good bottom color on the grain.

After staining the skins should be rinsed off in clean water and again pressed or struck out. They may also be flesh-colored and grain-blacked at one operation by drumming them first in logwood liquor and then applying the striker, either in the drum or by hand. Sometimes it is not necessary to fat-liquor the skins at all. Very little fat-liquor is required, anyway—less than for any other class of leather. On removing the skins from the fat-liquor they should be horsed up and allowed to remain in that condition for some hours or over night, so as to give the fat-liquor a chance to penetrate and combine with the leather. The skins may then be pleated and grain-blacked on a table in a tray or upon a machine, by the use of logwood liquor and iron strike. They are then set on the grain and given a light coat of glycerine and water, one part glycerine and one part water, well mixed together. It should be put on with a rag or soft sponge evenly over the grain and well rubbed in, just as oil is applied to leather. The skins should then be put out the second time and merely wiped over with an oily sponge, and then hung up to dry.

COLORING LEATHER AFTER TANNING, WASHING AND SHAVING.

The skins are ready for the dyeing process. This may be carried out in various ways. The skins may be colored in drums, in trays and they may also be dyed with brushes on a table. The drum method is the preferred way because the skins are colored in a few minutes with little labor, and the coloring is uniform and even.

DYEING.

Aniline dyes are the best to use. It is necessary that the grain be as clear and free from grease as possible. Tanning extracts are used as mordants with good results. Sumac is very useful in coloring sheepskins.

A practical method of using it is carried out in the following manner: For 100 pounds of leather weighed after being washed and shaved, three and one-half pounds of sumac are scalded in a closed vessel with three gallons of hot water. Sufficient time should be allowed to get the strength of the sumac extracted. The prepared sumac liquor is then commingled with ten gallons of water at a temperature of 100 degrees.

DRUMMING.

The skins are placed within a drum with one-third of the sumac liquor, and are drummed in the same for five minutes. Then another one-third is added and the skins drummed for another five minutes and then the last portion is added and the skins drummed for fifteen minutes longer. At the end of this time the leather will have absorbed all the tannin and the spent liquor may be run off. Before doing this, however, it is well to add to the liquor and skins ten ounces of tartar emetic or of antimonine dissolved in two or three gallons of water, and to run the skins in this liquor for fifteen minutes, after which the liquor may be run off and the skins rinsed off and then colored.

FULL, EVEN, FAST SHADES.

This way of coloring, carefully carried out, results in full, even and fast shades. The use of the second named articles is for the purpose of overcoming any uncombined tannin upon the skins, thereby clearing the grain and serving to fix the dye firmly upon the leather, doing away with the necessity of using any other settling agent.

NOTHING BETTER THAN SOFT, CLEAN WATER.

In preparing the aniline dye, nothing is better than soft, clean water such, for instance as exhaust steam. The water should be heated to boiling point, and the dye put in and allowed to go into solution, after which it should be boiled for a few minutes and then strained before it is used. When the coloring is done in drums, it is well for the dyer to start with about one-third of the color solution and at the end of five minutes to add another one-third and after the last one-third has been given to the skins to drum them in it for fifteen minutes or until they have fully absorbed the dye. It is best to keep the temperature of the liquors above 100 degrees. After dyeing the skins are washed in cold water and struck out and fat-liquored and dried out as soon as possible. They may be tacked on boards for the drying out.

FUSTIC VERY USEFUL.

Fustic is very useful in coloring the skins. For one dozen skins from four to eight ounces are required, according to their size, dissolved in hot water, and the skins drummed in the liquor for fifteen minutes. Palmetto extract is also a good article to use as a mordant upon chrome-tanned skins, as it fastens an aniline dye evenly and firmly. The quantity of dye required for each dozen skins must be determined by the workman, and depends upon the size of the skins.

PRACTICAL SUGGESTIONS FOR POPULAR SHADES.

The following are a few practical suggestions regarding some of the most popular shades: Very desirable tan shades are obtained by using a combination of phosphine and Bismarck brown, using about two and one-half ounces of the former and one ounce of the latter; also a combination of one and one-half ounces of new phosphine G and two and one-half ounces of Bismarck brown. A dark tan results from the use of three ounces of new phosphine G and one ounce of leather brown, and two ounces of Bismarck brown. For very light tan use one-half ounce of Bismarck brown mixed in solution with four and one-half ounces of phosphine saddened or subdued with a little blue or green. The proportions may slightly vary and still produce good results. These dyes may be too expensive for the average case. They are recommended, however, when extra fine leather is being made and when superior coloring is wanted. The cost in such instances is more than repaid by the rich and even colors that result from their use.

FOR COLORING ONE DOZEN CHROME-TANNED SHEEPSKINS A NICE SHADE OF OX-BLOOD.

Drum the skins for about fifteen minutes in four ounces of extract of sumac in sufficient water at a temperature of 110 degrees. Then add to the same bath two ounces of either tartar emetic or antimonine and drum the skins for fifteen or twenty minutes longer. Two pounds of dry powdered sumac may be used for each dozen skins in place of the extract. The skins are next washed off in warm water and a new bath prepared to color in at 120 degrees. Use from two to three ounces of the aniline dye amaranth 3-R and run the skins in this liquor for twenty minutes, then wash the leather off and proceed to finish it. A good shade of ox-blood is also obtained by the use of one ounce of Bismarck brown and three ounces of Russian red, the operations being carried out in the same manner as above. A dark shade of ox-blood can be obtained on chrome-tanned sheepskins by the use of two and one-half ounces of amaranth 1-R and one ounce of chocolate brown for each dozen skins. A mixture of fustic and peachwood liquors is used as a mordant.

FOR SOFT GLOVE LEATHER

the skins are fat-liquored after being colored. Emulsions of oil and soap are used. These are boiled until a complete emulsion is produced. Nothing more is necessary than oil and soap, although egg yolk may be an ingredient of the fat-liquor. Degras is also used on heavy skins. After the coloring operations are completed the skins are washed off and struck out or pressed as dry as possible. A pin mill

drum is heated to about 140 degrees with live steam, the skins thrown in and run in the drum for about fifteen minutes, so as to warm it up. The fat-liquor is then added, a gallon or two at a time, until the necessary quantity has been given the skins.

Good fat-liquor may be made as follows: Boil twenty pounds of potash soft soap in twenty gallons of water until it is all dissolved. Then add forty pounds of light English cod oil. Mix the oil and soap thoroughly together and then run in enough water to make fifty gallons of fat-liquor. Of this use three-fourths of a pail to each dozen skins. A good fat-liquor is made of ten pounds of soap, four gallons of oil and six gallons of degras and fifty gallons of water. Two gallons of this fat-liquor is enough for each dozen skins. Sheep and lamb skins may also be fat-liquored by the use of one pint of egg yolk and one-half pint olive oil thoroughly emulsified and applied immediately after coloring, and the skins drummed in the same for twenty minutes.

When the skins have been thoroughly washed after tanning and all salts and acids gotten rid of, and the water well struck or pressed out of the skins before fat-liquoring, from twenty to thirty minutes' drumming in the fat-liquor is sufficient. At the end of this time the leather should have absorbed all the grease and nothing but water be left behind. After fat-liquoring the skins should be either horsed up or placed in a pile for some hours so that the grease taken up will have an opportunity to penetrate and combine with the leather before it is dried out.

The skins should next be struck out upon the grain thoroughly and given a light coat of oil which should be applied warm and rubbed in with a sponge. The water should be well gotten out of the leather before the oil is applied, so that the latter can readily penetrate into the body of the skin, where it will stay and add strength to the fibers. Sperm or neatsfoot oil may be used.

CHROME-TANNED SHEEPSKINS.

A first-class chrome-tanned sheep leather for shoes can be made by the following method: Select a medium sized skin and either wring or press to remove the grease. Pressing with a hydraulic press is the most popular way. After pressing, mill in a solution of warm water and salt, using 20 pounds of salt and 25 gallons of water at a temperature of 85 degrees Fahr. for each 100 pounds of skins. Run in mill for half hour and rain off the surplus liquor. Make up a solution of 4 pounds glauber salts and 15 gallons of water, 85 degrees Fahr., and run skins in this solution for half hour, then drain again. Now take 10 gallons cold water and 5 pounds common salt and put in with the skins and run for five minutes. Make up a tan liquor of 16

pounds of concentrated one-bath commercial tan liquor dissolved in 6 gallons of warm water. (Have the water just warm enough to dissolve the tan liquor.) Add one-half of the tanning solution to the mill containing the salt solution and skins, and run for one hour, then add the remainder of the tanning solution and run for at least three hours. The length of time will depend upon the size of the skins. Be sure and get them tanned thoroughly, which can only be done by giving them plenty of time. When they are tanned, horse up or pile down for twenty-four hours. Then put them in an open wash wheel and wash for forty-five minutes with a generous supply of running water. When washed perfectly free from acid, press or put out on putting machine and shave very light—just enough to remove what flesh is on them and to even up the head and back. After shaving put into coloring mill and add enough warm water to wet thoroughly. Now dissolve 1½ pounds of logwood crystals (we get the best results from the alligator brand) in 10 gallons of water, 185 degrees Fahr. When dissolved add 3 ounces of carbonate of potash to logwood liquor, and cool to 165 degrees. Run skins in the logwood liquor twenty minutes. In the meantime, dissolve 4 ounces of alum in 2 gallons of water and add to mill and run ten minutes. Then dissolve 2 ounces of copperas and add to mill and run ten minutes. Drain off all the liquor and wash skins for ten minutes to remove all traces of copperas. They are then ready for the fat-liquor, which is made as follows: One-half pound of good neutral soap is dissolved in 10 gallons of water by boiling; when it is thoroughly dissolved, cool down to 165 degrees and stir in two pounds of best moellon degras. Run the skins in warm water for five minutes so as to get them warm. Drain off water and put in the fat-liquor and run for half hour. Horse up over night and in the morning set out and oil off on the grain side with a very light coat of paraffin oil. Hang up until perfectly dry, then dampen either in sawdust or by dipping in warm water and packing in boxes over night. Stake out good and hard and tack on boards until dry. When dry they are ready to glaze or finish into mat sheep for tipping leather.

A FINE FINISH FOR GLAZE SHEEP

is made this way: One pound of Ivory soap is dissolved in 8 gallons of water; 1 pound of glue dissolved in 8 gallons of water; 3 ounces of logwood crystals in 2 gallons of water, and add 4 ounces of nigrosine and half ounce bichromate of potash. When cold add 2 quarts of fresh blood. Now take 1 quart of glue solution and 1 quart of soap solution and mix into the blood and logwood solution. Stir well and strain. Give skins a coat when dry. Glaze and give second coat, dry and glaze.

For a mat finish use the following: One pound Ivory soap, half pound flaxseed, 4 ounces of beeswax; boil for half hour in 2 gallons

of water and color with 4 ounces of nigrosine B. When cool add 4 ounces gelatin dissolved in quart of water. Now dissolve 2 ounces aloes in half pint of wood alcohol and add to finish and strain. Give skins one coat and rub in hard. Dry and iron and give second coat, but do not iron. When dry oil off with one-half paraffin oil and half neatsfoot or sperm oil.

WORKING WOOLSKINS.

Considerable trouble has been and is being experienced by sheepskin tanners by the manner in which different lots of the same brand of pickled skins work in the different processes of tanning and finishing. One tanner recently said that he had been obliged to stop tanning a certain wool puller's skins because it was impossible to plump them in the tanning, and on lying a little while after being glazed the gloss faded and a dull, greasy appearance took its place. The cause for this was due, in his opinion, to improper beamhouse methods, not only in the preparing of the skins for pulling the wool, but also in the manner in which the slat was limed. He said the skins acted as if they had had a soap tannage, and that this effect was caused by sulphide of sodium acting on the grease in the skin.

This tanner believed that woolskins pulled by the use of sulphide of sodium needed more labor put out on them over the beam than did sweated woolskins. In sweating the woolskin a large amount of grease in the skin goes into the wool. By painting with sulphide of sodium the grease is left in the skin in the form of a soap, and it needs a fair liming and a good working out to rid the skin of this matter, especially if the skins are to receive a chrome tannage.

PROPER HANDLING OF SHEEPSKINS REQUIRES LONG EXPERIENCE.

To properly handle the different classes of sheepskins through the soaking, pulling and liming process requires long experience on the part of the workmen.

Today the slat is valuable as well as the wool, and if the skin is well worked throughout the different beamhouse processes it is possible for the tanner to manufacture a good piece of leather. The sheepskin is now so manipulated in the finishing that most of the high-cost leathers are imitated so closely that only an expert can detect the difference between the genuine and the imitation when the goods are made up.

By the use of the embossing machine an imprint of any figure desired is given to the grain, turning out either alligator, seal, snake, monkey, etc., according to the cut roll used.

RIGHT CONDITION FOR PULLING.

As the skins come to the puller either green salted, dry salted, or dry flint, the first step is to get them into proper condition for pulling. There is but very little difficulty in soaking green or dry salted skins, but in soaking sun-dried flint skins they are found to be troublesome. The skins have been dried in the hot sun, and while drying the grease, heated by the rays of the sun, burns the skin more or less, so that the gelatin, together with the grease, makes the pelt almost waterproof. To soften these skins, some tanners simply add borax to the water; others use a putrid soak; still others use a strong brine. After soaking a few days the skins are given a good breaking on the flesh and then thrown back into the soak. By this means the glacé on the flesh is broken and the soaking is more rapid.

AFTER BEING SOAKED

the skins are ready for the washing or burring machine. This removes the burrs, and the force of water which is driven against the wool side of the skin removes most of the dirt, and leaves the wool in a fairly clean condition.

If, after having been through the burring machine, it is found that the skins have not been sufficiently soaked, they are placed in clean water in the water pits and left as long as may be necessary. They are then drawn up and either packed in piles to press the water out or run in a revolving machine, called an extractor, which revolves at a tremendous speed. The skins are now ready to have the wool loosened, which is done either by sweating or by the use of a depilatory.

THE ENGLISH METHOD

of starting the wool is to paint the skins, after the soaking and breaking is accomplished, on the flesh side with lime, then fold them lengthwise and pack them down in a pit. When sufficient skins are placed in the pit they are flooded with water. After coming from the flooding the loose lime is rinsed off and the skin made ready for the sweating. This flooding of the skins keeps them from heating and also helps the lime to plump the skin. After the surplus water has been drained from the skins they are carried to the tainting stove, hung on the hooks and left until the proper stage of putrefaction has been reached. When the proper stage has been reached—which all experienced men know—the skins are taken to the pulling room and the wool pulled. After pulling the wool the skins are thrown into cold water and then drawn out and placed in weak, clean limes.

In starting the wool by the use of sulphide of sodium—which, by the way, is quicker and cheaper than the sweating process—considerable judgment and experience are necessary, as no rule can be given

which will do for all skins, since some are very greasy while others contain but little grease. Sulphide of sodium should be mixed with lime before painting, and the strength in which the sulphide should be used depends on the skin. If the sulphide is not properly mixed, iron and other stains show in the finished leather.

THE PAINTING OF WOOLSKINS.

should always be done in a moist room, and the edges of the skins kept from drying, or the wool will pull hard and lime blasts show on the skins in the tanning. Care should be taken by the workmen using the brush or mop that only enough liquid be used on the flesh of the skin to saturate it without having any surplus liquor running off the edges. After painting the skins should be folded lengthwise, wool out, and placed in numerous piles. In a few hours the wool starts and is easily pulled from the pelt by the wool puller; he sorts the wool into the different grades as it is taken from the skin. After the wool is pulled, the slats are well washed in water, to remove the sulphide, and then placed in the limes. To insure good, clear stock, the limes should be kept clean and sweet by running off the lime liquor often and cleaning the lime grounds from the bottom of the pit.

FOR GLAZED LEATHER

many tanners use red arsenic in connection with lime for liming the skins in the first limes, and then finish the liming in limes containing nothing but lime. In this manner it is claimed that the red arsenic keeps the grain from rising and a brighter gloss is brought up under the glass on the glazing machine. After the skins are limed they are "pieced" over the beam; that is, all useless parts trimmed away by use of a beamster knife. Here the working of the grain is often neglected, the beamster simply sliding his knife over the skin lightly, using only enough strength to straighten it out. Considerable grease and filth can be worked out at this time and this is the place to do it. After the skins are "pieced" they are fleshed on the machine and then bated. For a bate some tanners use bran, while others depend on lactic acid. After the skins are bated they are worked out and processed in salt and vitriol and are ready for the tanner.

JACKET LEATHER FROM SHEEPSKINS.

Sheepskins intended for jacket or coat leather coming from the press should be milled in the drum with salt and water. The amount of salt depends upon how highly the skins have been processed in pickling. A little whiting should be added to the salt and water in the drum to kill the vitriol used in pickling the skins. The whiting must

be well washed out again with warm water before tanning or the result will be poor, tender leather.

When skins are well washed, drain and tan in drum with solution of alum, salt, sulphate of soda and gambier, made up of 6 pounds of gambier, 2 pounds of salt, 1¼ pounds of alum, 1 pound sulphate of soda, and half ounce picric acid for each dozen skins. Bail gambier separately; other material also separately, and then unite in one vessel. Use this solution at 110 degrees Fahr.

To prevent drawing of grain and having a coarse, harsh skin, a bucketful of this liquor should be thrown into drum every five minutes while in motion. One hour is generally sufficient for tanning. Then horse up over night and fat-liquor next day.

FAT-LIQUOR.

To make fat-liquor put 10 pounds good potash soft soap in a clean barrel with 4 or 5 pails of water. Turn on steam and boil until soap is thoroughly dissolved. Next take 4 gallons of best neatsfoot oil and cut it by pouring a few ounces of dissolved borax (4 ounces borax dissolved in a quart of boiling water), and stir thoroughly through the oil. Add this to the soap in barrel. Melt 10 pounds French degras and put in with soap and oil, stirring thoroughly. Next run in cold water enough to make 50 gallons. This will cool solution enough to make it ready for use.

Heat drum with steam before fat-liquoring and use 2 gallons of above mixture for each dozen skins. After fat-liquoring the skins are blacked and table by brushing. Slick them out so as to keep the flesh side clean and retain a nice yellow. Give first a brushing of bichromate of potash, 1 ounce of bichromate to a gallon of hot water. Then logwood thoroughly until a good dark bottom is got. After blacking rinse off skins (while still stuck to the table) with water, which will prevent smutting. Hang up and dry. They are then dampened by dipping in water or packed in sawdust.

STAKING.

They are then staked. After staking they are arm crutched in the perch. After crutching they are tacked out on boards and dried thoroughly. When dry they are buffed on an emery wheel to remove flesh, etc., etc. If a good finish is wanted they are seasoned, putting on a good coat so as to get a face. They are then rolled on the grain. Do this well and dry thoroughly in hot room.

The next thing is to oil them on the grain, which helps make them waterproof. It may be simply heated oil (equal parts paraffin oil and neatsfoot), or a mixture of beeswax, paraffin wax and neatsfoot oil. But whichever is used, it must be put on quite hot. A little judgment

is here required, as the quantity of this last oiling is determined by how much fat-liquor the skin contains.

As a last thing they are sometimes ironed, taking care not to use iron too hot.

TAKING GREASE OUT OF SHEEPSKINS.

For 50 dozen X pickled sheep, or 40 dozen XX pickled sheep, or 35 dozen XXX pickled sheep, use the following receipt, which will remove the pickle and grease at one operation and which will be found valuable and effective:

Into a vat connected with paddle wheel and containing about 2,000 gallons of water, put 50 pounds whiting, 5 pails common salt and 20 pounds of sal soda. The temperature of the water containing these materials should not exceed 95 degrees Fahrenheit. After the skins have been dumped in, let the paddle run 15 minutes. Then let these skins alone for about one hour or until they rise to the surface. Run paddle again for about 15 minutes and wash the skins well in cold water before tanning.

For cleansing tanned sheepskins from grease without using wringer or press, I would suggest the naphtha process. This should be done in a building apart from the main factory and no flame or light should be used near where this degreasing is performed.

Take a tank or vessel of sufficient size to hold the amount of stock to be treated, and put in enough naphtha to leave room for the tanned skins, which should be thrown in loose and separately. It will probably take about an hour to extract the grease, but one must use judgment, as much depends on the condition of the skins. After they have been in naphtha half an hour, a difference will be observable in them. When the time seems ripe, the skins should be taken out and hung up to air until the naphtha contained in them was entirely evaporated.

TO REMOVE WOOL FROM TANNED CLIPPINGS.

As the skins have been tanned in salt and alum, it is a simple matter to rid the wool of the hide substance. The writer of this has handled many tons of these alum-tanned pieces in the following manner: The wool pieces were placed in a vat containing about 1,000 gallons of water to which two gallons of vitriol had been added. The whole was then thoroughly boiled by the use of steam. In a vat of this size 600 to 700 pounds of wool pieces can be boiled at one operation. If a vat is not convenient, a good sized hogshead can be used. The salt which is used in connection with the alum in tanning the skins offsets the vitriol so that it cannot harm the wool in any way.

It is not absolutely necessary to use vitriol in the process of boiling

the wool pieces, but through its use the process is hastened, as the acid swells the side substance, making it more easily dissolved. It is necessary to cover the vat or hogshead to retain the heat.

GOOD WAY TO MAKE CHROME SHEEP LEATHER.

Before tanning the pickled sheepskins by the chrome process, the first thing to be considered is the removal of the grease. This may be done either by wringing or by the use of the hydraulic press. On most skins the latter method is to be preferred, being much more effectual than the wringing.

REMOVING THE GREASE.

For pressing, a few dozen skins are spread out smoothly between each plate until the press is filled to its capacity, and as the pressure is applied it really is surprising to see the amount of grease that flows from the skins. On coming from the press the skins will in texture and thickness resemble tin quite as much as sheepskins, and, in order to get them back to something like their natural condition, they must be milled up in a solution of warm water and salt.

In the milling process as many skins as the drum can conveniently carry are placed in it; it is then set in motion and a bucket of the salt water thrown in. This breaks apart the cakes and the skins are then ready to take up more water, which should be thrown in only as fast as the skins can absorb it. It is impossible to give the proportion of salt to be used in the water, since the amount of vitriol in the processed skins varies to such an extent. Only sufficient salt should be used to offset or counteract the vitriol. This can only be determined by experience. Sometimes there is but little vitriol in the skins, and then again they come to the tanner very highly processed. Care should be taken that all parts of the skin be thoroughly softened, especially along the backbone, as more or less grease has been left here in spite of the pressing, and the skins along this portion will often be found to be hard after the flanks and bellies have become soft.

TANNING.

After the skins have been thoroughly softened in the milling, give them the bichromate of potash and acid if they are to be tanned by the two-bath process. If they are to be tanned by the one-bath process, the next step is to remove the pickle. For this purpose they are treated to a bath of salt and whiting, to which a little borax is added. Salt is used in milling merely to counteract the vitriol or prevent it from doing harm while the skins are being milled. Salt added to the whiting

bath is to keep the skins from "huffing," as would be the case if placed in a bath of fresh water and whiting. The salt keeps the vitriol in check until the whiting kills the vitriol. Then the salt and the whiting are both to be washed out in a bath of fresh water.

IN TANNING BY THE ONE-BATH SYSTEM,

if the pickle or process is not removed, the leather will be more or less tight and tinny, depending upon how highly the skins have been processed.

This condition is caused by the combination of alum and acid, and it is for this reason that all alum tanners drench their skins in a bath of whiting and salt before starting in to tan them. The whiting, however, has to be thoroughly washed out to prevent tender skins.

PREJUDICE AGAINST WHITING.

Some are prejudiced against the use of whiting in the manufacturing process because of its tendency to rot leather, but when used on the green skin for the purpose of killing the vitriol it is easily removed by washing in warm water. When leather lying in stock after being finished rots, it is usually because whiting has been used in the logwood to intensify the black.

FOR THE ONE-BATH,

a tannage consisting of salt, sulphate of alumina and flour is given to skins previous to the chrome liquor. After this alum tannage has been well drummed into the skins, the chrome liquor is given in the proportion of three gallons to every 100 pounds of skins. The skins are run in this solution until the pale green oxide of chrome has thoroughly penetrated the thickest portion.

THE TWO-BATH PROCESS.

When the skins are to be tanned by the two-bath process, the pack is placed in the drum, and for each 100 pounds of skins 5 pounds of bichromate of potash is dissolved, to which 2½ pounds of sulphuric acid is added. In this mixture enough salt must be carried to offset the acid. Sufficient water is added to the solution to make a liquid in which the skins can move freely, and this is thrown into the drum in small quantities until the entire amount has been given to the skins. The skins will be in condition to take from the drum when the raw hide in the thickest portion shows that the yellow is struck through. The skins are then horsed up and left for a day or two. They must not be exposed to any direct air, so that they can dry on the edges. The tanning and filling of the skins will then go on as they lie in the

pile. Many have made the mistake of taking the skins direct from the wheel and striking them out, then putting them in the reduction bath before the chromic acid has done its work. They have then wondered why their skins have come out hard after being finished. After the chromic acid has done its work the skins are struck out on the machine to remove the wrinkles, as well as surplus liquor, and are ready for the reduction.

THE REDUCTION OF CHROMIC ACID

may be performed by the use of argols or tartar, tartaric acid, lactic acid, oxalic acid, bisulphate of soda, and by hyposulphite of soda. Hyposulphite of soda and acid is generally used to change the chromic acid to oxide of chrome. For a bath of this solution, to every 100 pounds of skins, 12 to 15 pounds of hyposulphite of soda are dissolved, to which 4 pounds of muriatic acid are added. The skins are paddled in the water to which this dissolved solution has been added until the reduction is complete. This is seen by the pale green color reaching entirely through the thickest portion of the skin, the yellow having entirely disappeared.

The skins are now horsed up and left for a few days to allow the tannage to become well fixed. The skins are next washed in water containing an alkali. Borax is generally used because of its non-burning qualities, besides keeping the grain of the skins open for the coloring and seasoning. Many think the acid does not do the harm that is laid to its door. No other tannage needs as much washing as does chrome, for the reason that very little grease can be used in the chrome in comparison with that used in the vegetable tannage. If a little more attention were paid to looking after the acid in some of the vegetable tannages, there would be less "spewing" in the leather in use today.

After the skins are washed they are colored in the drum, drained and given a light fat-liquoring. After this they are put out on the machine and hung up to dry in the air.

MISTAKE TO TACK UP SKINS.

Many are tacking their skins on the drying boards directly after being put out. This is a mistake, since all tanned leather needs to contract in the drying and then have the fiber stretched afterwards. In the case of the sheepskins, as it is loose-fibered, it does not need nor will it stand the manipulation in the staking as will the goat or calf skin. All that is necessary for the sheepskin is to fairly dampen it and then soften by arm-crutching in the old-fashioned manner by placing the skins in a perch and softening with the moon knife.

As soon as arm-crutched the skins are tacked on boards for the

drying. When the men have tacked the skins to the boards, and while the skins are yet damp and the pores open, it is well to season them for the glazing. In this way a heavier seasoning can be used and the pores of the skin better filled than by waiting until the skin is dry and reaches the finishing room.

PREPARATION OF SKINS FOR GLAZING.

After drying, the skins are pulled from the boards and buffed on the emery wheel to remove what loose flesh there may be. On reaching the finishing room the hard edges are trimmed, which would, if left, pull the skin from the hands of the operator of the glazing machine; then, as the skins have once been seasoned, all that is necessary is to slightly wet them over and they are ready to be glazed. As the skins are here only slightly dampened, instead of heavily seasoned, there is no need of hanging them up, and the agate or glass slips over the surface easily instead of dragging over the grain. Two glazings are generally necessary to insure a bright gloss, the first glazing to bring up the bottom and the second to brighten the top gloss. To get a nice bright gloss it is necessary to wet over the glazed surface after the first glazing, and then glaze the skins under the proper pressure for the second glazing. The second glazing must be closer than the first, or the streaks from the glass will show.

CAUSE OF DULL GLAZING.

Many finishers of sheepskins who have tanned by the chrome process have brought the skins to the glazing machine in good shape, and then have had lots of trouble in getting a gloss which would be permanent, one that would not dull after lying for a short time. This dulling of the glazed surface is caused by the grease working out on the grain, and can be obviated by using a weak solution of lactic acid before wetting over the skins in the finishing room.

LATEST METHODS FOR MAKING CHROME-TANNED CALFSKINS FOR SHOE LEATHER.

The skins are first sorted, so as to get the different sizes into separate lots. The hide or skin merchants do not sort their hides and skins as they should be worked through a tannery. This may appear to be labor wasted to some tanners, but it will more than pay for the labor when the skins are on the sorting table; 4 to 5 lb. skins worked through the beamhouse and tannery with 9 to 12 lb. skins cannot make as fine a piece of leather as it would if it was put through in a lot of small skins, and vice versa.

For green salted skins, soak 24 hours in clean cold water, then mill for 15 minutes and soak from 12 to 24 hours. They should now be trimmed and fleshed or broke, as some tanners call it. The trimming should be done by a careful man, for a great many feet of leather can be saved right here. They are now ready for the lime. To start with the first day, make up a new lime, using 2 per cent of lime—that is, 2 lbs.—for every 100 lbs. green salted weight. The second day haul the pack, plunge and put back. Be sure and spread the skins as they are put into the lime; do not throw them back in a bunch and expect uniform results. The third day haul and give 2 per cent more of lime; the fourth day haul, plunge and put back; the fifth day haul and give 3 per cent of lime and 1½ per cent red arsenic; the sixth day haul, plunge and put back; the seventh day 3 per cent lime, 1½ red arsenic; warm to 75 deg. Fahr.; the eighth day haul, warm to 80 deg. Fahr. and put back; unhair on morning of 9th day. The hair will come easy and can readily be taken off with a machine. After unhairing, they are washed from five to ten minutes in a wash wheel in cold water. They are now refleshed and worked for fine hair.

Another way to lime the skins in four days' time, and which gives first-class results, and does not require fine-hairing, is as follows:

After the skins are fleshed from the soaks, make up a solution for each 100 lbs. green salted weight. For the first pack and first day use 3 per cent lime, slake, dissolve 1½ per cent sulphide and add to the lime. Mix well and put into vat and throw in the skins. The second day haul skins and give the same amount of lime and sulphide of soda. The third day haul the skins, plunge and put back; the fourth day haul, warm the lime to 80 deg. Fahr. and put back; unhair on morning of fifth day. The second pack is now started in the old lime in the morning and pulled and put back in the afternoon. The second day pull the skin, run off all the old lime and make up a new lime, using 6 per cent lime and 3 per cent sulphide; plunge well and enter skins. Now handle the same as the first pack was handled on the third and fourth day. Every pack following should be handled the same as the second pack; in this way every pack is started in an old lime and finished out in a new lime. Skins limed this way can be unhaired on a machine and do not require working for fine hair. After they are unhaired they are washed in cold water for 15 minutes; they are now ready for the bate.

BATING.

There are numerous ways of bating a skin. Some tanners claim they get good results with an acid bate, but the best results are obtained with a bacterial bate. The bating should be done in a paddle wheel, which has a steam pipe with a box over it, so that the bate can be warmed while the skins are moving. The paddle should be covered

tight with a door in the front end which can be raised when putting in or taking out skins. The cover will enable you to keep a more uniform temperature, which is much better than starting in warm bate and rewarming every two hours, which you will have to do with an uncovered wheel. If bating over night is preferred, warm the bating liquor to 80 deg. Fahr. Enter skins and run paddle one hour before stopping for the night. Have the skins all ready to go in before starting to put in any of the pack. Throw them in as fast as possible so they will all get started at the same time. Keep the paddle running all the time the skins are going in. In the morning start paddle and run one hour if the skins are not down enough, then warm to 85 to 90 deg. Sometimes the addition of more bating material is required. This must depend on the judgment of the man in charge of the bate wheels.

If bating in the day is preferred, the bating liquor is warmed to 85 to 90 deg. Enter skins and run the paddle one hour; allow them to rest one hour, then run the paddle one-half hour at intervals of one hour until the skins are low enough. There are different ways of deciding when a skin is bated low enough. The best and most popular way is to take a skin, double it over, take the edge between the thumb and first finger and press hard; open up the skin; if pinched edge remains sharp, the skin is bated. They should now be taken from the bate and washed in warm water 80 deg. Fahr. for 5 minutes. They are now ready for the pickle. Pigeon manure is considered the best bacterial bate to use, but the supply being limited, chicken manure is used with good results. The amount of manure to use depends on the size of the pack of skins and the paddle used.

There are bacterial bates on the market which give first-class results and are much more uniform than manure. They contain no dirt or foreign matter, and a tanner can tell just how many pounds to use for each pack, a thing he cannot do with manure. With a good bacterial bate, such as is on the market, no bran drench is required, which is a large saving.

PICKLING.

The pickling is done in a paddle wheel, as follows: To start a new pickle, dissolve 40 lbs. salt for every 100 gallons of water in the paddle tub, then add to the salt water 10 lbs. salt and 1½ lbs. sulphuric acid for every 100 lbs. of skins weighed from the bate wash. Throw in the skins while the paddle is running and keep it running for two hours, then horse up nice and smooth for at least twelve hours. Some tanners do not pickle, neither do they get uniform leather. The pickle is the place where the skins are prepared to receive the tanning liquor; it opens up the skin and puts every part in the same condition.

After they have been horsed up twelve hours, they are ready for tanning.

If the two-bath method is to be used, weigh your skins and put them in the mill with 5 per cent of salt and twelve gallons of water; dissolve 5 per cent bichromate of potash in three gallons of water and add 4 per cent muriatic acid, add to the mill of the skins and run from three to five hours. The length of time depends on the weight of the skins. When the skins are a deep yellow all through they are taken out and horsed up for twenty-four hours. They are then placed back in the mill and 18 per cent of hyposulphite of soda is dissolved and put in with the skins and the mill started. Now take a wooden pail half full of water and add 6 per cent of muriatic acid. Have a lead funnel for the gudgeon and run the acid solution through the gudgeon while the mill is going, and be sure and keep the mill going for at least one hour. If the mill stops in less time than that the skins will be ruined. Run the mill three to four hours, then cut into the thickest part, and if they are blue all through they are tanned; if any trace of yellow remains, they must be run until it disappears. They are then tanned and ready to be washed.

If the one-bath tannage is to be used, which is preferable on account of the expense and measurement, the skins are placed in the mill with 8 per cent salt, ten gallons water, and milled for half an hour. Then feed your first portion of tan liquor, and in a half hour add your second portion, then in one and one-half hours add the last portion, and run the mill until the skins are tanned. The best way to tell is by placing a piece cut from the heaviest part of the skin in a pail of boiling water. If it curls it is not tanned; if it remains flat and soft it is tanned, and they are to be horsed up nice and smooth from twelve to twenty-four hours; twenty-four hours is the best, and forty-eight hours is still better.

I will not attempt to tell how to make a one-bath tan liquor, as it is a very difficult thing to do, and get uniform results, unless the tanner has a perfect knowledge of chemistry. There are liquors on the market that run uniform year in and year out that can be bought at less than a tanner can make his own liquor.

After the skins have been horsed up for twenty-four hours they are then washed until all traces of acid is gone. It is best to wash in an open mill with running water for about one hour. The two-bath leather will require one and one-half to two hours' washing. After they are washed they are put out and shaved. When shaved they are weighed for the staining and fat-liquoring. To stain dissolve 1½ lbs. of logwood crystals for each 100 lbs. shaved weight in 12 gallons water by boiling, cool to 150 degrees Fahr. and run skins in logwood solution twenty minutes. In the meantime dissolve 3 oz. blue nigrosine in 3 gallons water, and when the twenty minutes are up add the nigrosine solution and run fifteen minutes. Then dissolve 2 oz. copperas, half oz. bluestone in 3 gallons water. Add enough cold water to cool to 100 degrees and add it to the mill of skins; run fifteen minutes and

drain mill. Wash the stained skins for ten minutes with clean warm water, so as to remove all traces of the copperas. They are now ready to get liquor.

FAT-LIQUOR FOR GLAZED CALF.

The fat-liquor for glazed calf is as follows: One per cent fig or olive soap boiled until dissolved, then add 2 per cent of olive, neatsfoot or cod oil and boil twenty minutes; turn off steam and add 2 per cent good moellon degras. Stir well for five minutes, then dissolve 1 oz. caustic soda in 2 quarts water and add to fat-liquor. Stir well, cool down to 125 and add to stained skins and run one-half hour. Take out and horse up for twelve hours.

A FAT-LIQUOR FOR MAT OR DULL CALF

is made of 1 per cent soap, 4 per cent oil and 2 per cent degras, 1 oz. caustic soda. It is made the same as the glaze fat-liquor. Run skins in fat-liquor one-half hour, then horse up over night. In the morning set out and oil off with a mixed oil as follows: One part neatsfoot and 3 parts paraffin for glazed calf, and 2 parts neatsfoot and 2 parts paraffin oil for dull or mat calf. After oiling off hang up until dry. The best results are obtained from slow drying. That is, in a room at a temperature of about 80 degrees, with a good circulation. When dry the skins are dampened and staked.

DAMPENING.

The best way to dampen is to have a tub 6x5 ft. and 3 ft. deep; fill two-thirds full with warm water, 100 to 125 degrees. Take about twelve skins at a time and put into the warm water and allow them to remain about three minutes, then remove and pile on the floor. When about 100 skins are dipped put them in the sawdust box and press down hard, then cover the pile with damp sawdust. Be sure and cover every part of the skins and put about twelve inches of sawdust on top of the skins. Allow them to remain over night. They are then ready to be staked and tacked. This method of dampening will be found far superior to the old way of putting damp sawdust between each skin.

STAKING AND TACKING.

When the skins are taken from the dust box they are staked and tacked out smooth. Be sure and have them tacked well, for a lot of measurement is lost if the skins are not tacked out nice and smooth. When they are dry they are trimmed, and if they are to be finished for mat calf they are given a coat of finish; hang up to dry, then give

another coat; dry and iron with a hot iron. They are then staked. This way of finishing will leave the skins feeling soft and full. If they are staked, then finished and ironed, they will feel flat and will not break fine.

If the skins are to be finished into a box or a smooth, bright finish, they are staked right after trimming, then given a coat of finish. Hang up and dry, then glaze. Then give another coat of finish, dry and stake. After staking, glaze the second time. If they are for smooth glaze, they are now oiled off with hot oil, using half paraffin oil, half neatsfoot oil, or No. 3 finishing oil. If they are for box finish, they are boarded first from head to tail, then across from side to side. They are then oiled off same as the smooth glaze.

A GOOD FINISH FOR GLAZED CALFSKINS

is made as follows: Boil 2 oz. whole flaxseed one-half hour in 1 gallon water, then strain and add 2 oz. logwood crystals, 2 oz. nigrosine black, half oz. bichromate potash. Then cool to 90 degrees Fahr. and add half pint Vinette, 1 quart blood, half pint glycerin, 1 oz. crystal carbolic acid. When all the ingredients have been put together there should be two gallons. If there are less, add enough cold water to bring it up to two gallons.

FOR A FINE MAT OR DULL FINISH,

boil one-half hour 1 lb. Ivory soap, 1 pint neatsfoot oil, half lb. whole flaxseed, 3 oz. beeswax in 2 gallons water. Cool and strain. Then dissolve 3 oz. nigrosine black in a quart of water and add. Now dissolve 1 oz. powdered aloes in half pint wood alcohol and add to finish. Stir well. This will make a fine dull finish with a nice dry feel.

TO MAKE THE SO-CALLED GUN-METAL FINISH,

take the skins as they come from the trimmer and give them a coat of bright finish, dry and glaze; then stake. Now make up the following finish and give one coat. When dry, iron and oil off with hot oil.

Soak 1 oz. gum tragacanth twenty-four hours in half gallon water. Then stir into a solution. Now dissolve half oz. yellow dye in 1 quart water. Take 1 gallon of glaze finish and stir into it 1 quart of the gum solution and then add the yellow dye solution, a little at a time, stirring well until the finish has changed from a black to a green black. Be careful not to get too much yellow dye in or the leather will finish up too green.

Splitting Leather, and Splitting Machines.

INSTRUCTIONS FOR SETTING UP AN IMPROVED BELT KNIFE SPLITTING MACHINE.

It is not altogether easy to erect and successfully run the improved belt knife splitting machine. To accomplish this properly requires much patience and perseverance, and in order to help a beginner and start him in the right direction, I will give some directions which may save trouble and prevent costly and vexatious delays.

Put the knife upon the wheel, and by means of the round head screws in the sliding boxes, draw the wheels apart so as to tighten the knife upon them. The round nuts upon the brass quills or boxes enables one to adjust the knife until the edge comes within one-eighth of an inch from the notch in the head block, at the same time shows a straight edge and runs smoothly, while hugging the flanges on the wheel.

This is very important, as you can not split unless the knife runs properly.

Start the machine and grind the knife. You can get the desired bevel upon the knife by means of the two screws in each grinder arm. One screw, aided by the wrench, will draw the wheel towards the knife. The other screw, by using the hand wheel at the top and bottom of the arms, carries the wheel up or down.

For ordinary work you will find a bevel the same on both sides and about ¼ inch long the best.

Grind until you have the proper bevel and a keen, smooth edge. Then set back the wheel and readjust the knife. See that it is at the same distance from the notch in both head blocks and straight upon the edge.

Now lay the back plates upon the jaw with the edge of the back screw in the brass tip on the plate. Put a convex washer upon the tip of each screw in the jaw, and see that the screw is turned down so that the washers rest upon the casings of the jaw, and not upon the screws. By aid of the screws draw back the plates from the knife, and lay the caps upon the jaw. Feel through the holes if all the washers are loose, and not held by the caps. Put the concave

washers on the screws, and put all the screws in place, and screw them down finger tight.

The cap now lies flat upon the knife, the whole length. Take the end screws of the outside row and loosen the screw, placing your finger firmly upon both jaw and cap, turn up the screw until you feel the cap lift up from the jaw, about the thickness of paper.

Now hold the nut with a wrench and turn down the screw tightly. Do the same at the other end and follow along the entire row, being careful to raise the cap equally in each place. Take the inside row and placing your finger firmly upon both knife and jaw, screw up the nut until you feel the washer strike the cap; then secure it. When this is properly done the knife will be free from the jaw at the back, the thickness of paper. At the front it will be just free enough to allow the knife to slip through.

Test the bolts and see if the knife is loose enough. See if there are any slack places in the front. Do this by taking a screwdriver, over the brass rings and under the knife, employing it as a lever. By putting your finger upon both knife and jaw, you can detect any looseness. The knife must be tight enough in the jaw not to waver, or the splitting will be uneven.

Start the machine and allow the knife to get its position; then set the back plates. Put your finger upon the jaw and knife and turn the end screws until you feel the plates touch the knife. Then secure it. Now place the board so as to keep the chips out of the jaw.

Everything being now ready to start, take a piece of leather and turn down the beam until you think it far enough to run through the leather. If too thin, raise the beam; if too thick, lower it, and so adjust the other end until the piece of leather will be split to the same thickness at any part of the machine. You can now go ahead with safety and satisfaction.

Too much care cannot be taken to prepare the leather before splitting. The method of taking the dry leather, wetting it in a box, and then splitting at once, is bad, and good work cannot be done in this manner. You must begin slowly, and examine your work as you progress. Much depends on the feeder. No machine will split well if the feeder is not able to do his work without stopping continually to pull back or straighten the leather.

INSTRUCTIONS FOR STARTING THE IMPROVED BELT KNIFE SPLITTING MACHINE.

FOR BEGINNERS ONLY.

Everything being ready, take a piece of leather, turn down the beam until you get the required thickness, then run the leather through. If too thin, raise the beam; if too thick, lower it, and so adjust the

other side until a piece is split the same thickness at any part of the machine. When you are satisfied that the machine is set and adjusted right and runs to suit, and everything being ready, arrange the leather in two piles behind the machine. Place it so that the backs, as you pick the leather up, will come against the head blocks, the flank at the middle. Put the heaviest at the bottom, the lightest at the top, for as your knife wears away you are feeding larger leather, which requires more room. You thus avoid resetting the knife so often.

Take a side of leather, grain up, the hind shank first, and the back hanging straight. Lay it on the ring plate and spread it as flat as possible. Hold the leather from feeding too fast. As soon as it begins to feed take the loose end and with the hand on the ring plate spread the side out so as to be sure not to let the leather catch; at the same time be sure it will not catch at the middle, before you are properly started, so the leather will spread evenly, and not bunch up in the middle. When this occurs, you must stop the machine, raise the beam and draw it back as far as the leather is bunched; then turn down the beam and start again. The less hindrance you put upon the feeding the better the results will be. Experience alone can tell you how much to keep the knife up or away from the notch on center. But until you have experience, adopt one-eighth of an inch as a safe distance, or rather the nearer you can come and have a scrap of leather feed straight when the machine is set, the better you will be. If the knife is too close, the leather will not feed through, but will be carried by the knife along the jaw to the end.

TROUBLES VARIED.

Of the various troubles which may happen or the failure to do good work, I can say but little. The same thing seldoms happens twice, and there may be more than one cure for any trouble. But as a rule, if the machine is properly set, the rubber rule straight, the rings all the same size and properly adjusted, the gauge rule and friction rule straight, the jaw in condition to hold the knife, you must split well. Of course, the knife must be kept well ground. You cannot split with a dull knife. Run the machine as fast as it can be fed well. A great deal depends on the feeder. No machine will split well if the feeder is not able to do the work without continued stopping to pull back or straighten the leather.

INSTRUCTIONS FOR SPLITTING RAW HIDE WITH A BELT KNIFE SPLITTING MACHINE.

To split raw hides, take them after being unhaired out of lime wash in a wheel, and then lay them on a horse, to drain over night,

being very careful to see that all the wrinkles are smoothed out. Be sure the machine is properly erected, as the greatest care is required to split this class of stock properly, and few splitters thoroughly understand splitting raw hides. Experience has taught me that to get the best results the nearer the knife is to the center the better. Wide bevel must also be used, the wider the better, as the knife is not so liable to choke and bind. Use a corrugated gauge rule, as with a smooth rule the sides will not feed through properly.

The knife requires constant care and oiling, and to do this use two or three wipers, made from cotton waste, which oil often. Great care must be taken, after a good edge is on the knife, to see that both grinders touch the knife with the same pressure on each side, otherwise you will have a wire edge, and cannot split evenly.

Someone may have a better way for doing this work, but the above gets good results.

SPLITTING LEATHER.

The corrugated feed roll for the belt knife splitting machine has come to stay, and, like all new inventions, it met with a great many objections. It has overcome about everything that some splitters said it could not do and has caused a revolution in splitting. It has done away to a great extent with pressing leather for splitting. A successful way is to take the leather from the yard, run it through a drum putting-out machine, then skive and split it. This way is a great saving in labor, as it does away with the pressing and milling and stoning. It is not advisable to take a new corrugated roll and use it, as it will leave marks on the grain. Take a new roll and rub down the sharp edges on the corrugations with a fine flat file and you will have no trouble with corrugation marks. The most benefit derived from this way of splitting is not what is saved in labor, but the condition the leather is in when it comes from the splitting machine. As every tanner must know that the less moisture taken from leather that is not full tanned, the better results he will get when he re-tans his split stock.

In pressing leather for splitting it is impossible to get it in a perfectly uniform condition; some parts will be quite dry and some just the opposite. The parts that are dry will not take the re-tanning liquors as well as the parts that are wet. Some tanners will say it is very easy to take stock that is split and run it in a mill with water to get it uniform. Yes, you can, and every turn of the mill you will lose so much hide substance, for it is very easy to wash out the gelatin from a hide that has been in the liquor from twelve to fourteen days, then split.

It very often happens that a young hand or apprentice works several months learning to split and is kept back by his instructor not

showing him the fine points of setting the machine, very often resulting bad work, for which the operator is blamed, while the instructor is the guilty one.

GRIND KNIFE PERFECTLY STRAIGHT.

The first important point is to grind the knife perfectly straight. When grinding the knife, each end generally comes to an edge sooner than the center, which is natural; as the center is used more than each end, it naturally becomes thicker on the edge in the center and takes longer to grind to an edge. As a result there will be a little more wire on the ends than in the center in order to keep the knife straight.

Next comes the setting of the knife to the gauge roller. The knife must be bolted tight in place and the center of the roller should be set perfectly over the edge of the knife. The center is found by removing the roller from the beam, then turn down the beam; use a fine thread and plumb ball, and pass the thread up from underneath the knife and hold the thread across the center of the center pin; then the beam can be let back or forward until the thread just scrapes the edge of the knife. This brings the center of the roller in a perfect line with the edge of the knife when the roller is put back in place. To have the pins support the roller alike at both ends, put a narrow piece of thin paper in the hole at each end of the beam heads. Have the paper reach across the end of the bolts, then let down the beam and turn the bolt at the opposite end of the machine to suit the one you centered the roller by, until both hold the paper alike.

THE SPRING PLATE.

Next comes the spring plate, which is a very important point. There are usually two spring plates on the bed of a machine that rests on a row of set screws. The top plate should be not less than one-half inch further out than the bottom plate, and the edge of the top plate should be two and three-quarters inches from the set screw in the bed. The plates must be bolted down tight at the back and they should be sprung up from the bed by the set screws three-eighths of an inch. Then adjust the bed by the bed posts so as to bring the plates down to the level of the knife. The distance between the knife and plate should be be about three-thirty-seconds (3-32) of an inch. Set the bed post at each end of the machine and have the plates just high enough so you can't feel the edge of the knife when drawing your fingers from the plate across the edge of the knife. Then set the rest of the bed posts to suit the ends. Have the bed rest on each post alike; by tapping the plates with the side of the hand over each post you can tell by the sound if there is a post lower than the rest or not.

THE GUARDS.

Then come the guards. First set a guard at each end, then put a piece of paper between the guard and place of each guard, and adjust each one until they all hold the paper alike. When this is done, the machine is set in a way that will suit any kind of stock, either hard or soft, light or heavy, and will work with ease. Should any of the bolts or bed posts work too easy and not stay in place, fasten them with a lock nut. In this way you can always keep the machine perfectly set, insuring good work.

Never imagine yourself too busy to look over your machine. Examine and sound all the working parts every morning and be sure everything is right before starting, and you will get good results.

THE BACK-PLATE STRIP.

The writer is a strong advocate of the back-plate strip, a little device that obviates and overcomes a lot of the troubles of the early pioneers in the business. When I stop to think of the troubles we all of us used to have with our back plates catching under or over the knife, I often wonder why some of us did not have brains enough at that time to think of this little thing, which is now saving a large part of us a whole lot of trouble and nerve-racking, for it did certainly work on our nerves to have the back plates catch and bring the machine up standing, causing us to take our jaws off, file the plates, replace the jaw, and then not knowing how long before the blamed thing was to happen again.

Happily, one of us, after long years, thought of this little thing which has practically overcome that annoyance, and now we are going along feeling almost absolute faith in this little strip, that without it years before gave us so much trouble. It is merely a strip of steel the length of the jaw, whether it is 106 inches long or 57 inches, about three-eighths of an inch wide, and one gauge thinner than the knife. This is placed between the knife and the back plates. It being a continuous strip, it cannot very well get under or over the knife, but holds the same to its position, so you see the plates themselves do not come in contact with the knife at all and consequently receive no wear. Of course the strip will gradually attain a wire edge from contact with the knife, which can easily be removed with a file.

IMPROVEMENTS IN BELT KNIFE MACHINES.

There have been several improvements added to the belt knife machine in later years, all of which may serve the purpose intended, but I think this little device has overcome more of the troubles of the operator than anything known or shown up to the present time. These

strips cost comparatively nothing; they can be obtained from your knife manufacturer, some of whom give them away with a case of knives.

Not many years ago I started a new 106-inch machine for a well-known western firm and told them to order the makers to send one of these strips, sure. On setting up the machine the superintendent wanted to know about this particular part, and on explaining to him and also demonstrating, he said at once it was the best improvement he had seen added in later years, for on their old machine, which they discarded, they had constant trouble with the plates catching, and it was partly that that got them down on the old machine. It is needless for me to say that everything went along smoothly in regard to this very old trouble. If you are not using them, get one or two right away and save yourself lots of trouble and the company lots of time.

KEEPING MACHINE IN ORDER.

It is too bad the way I have seen some machines kept. It is not much trouble and does not take much time to go over them with a handful of waste after the day's work is done. I always insisted that my helper should take at least one-half hour a day to do this work, and one feels so much better satisfied working on a good clean machine. The grinder box especially should be cleaned out every day. I know of two instances where the fire department has been called on account of neglect to do this; this of course happened in the night and was caused by the operator running right up to the whistle and then leaving everything in a condition which was liable to result in a fire at last. In some sections the insurance companies insist on this being done and they follow the matter up pretty sharply, too. You can readily imagine that these sections are where the fires occurred. Keep your machine in good repair always. This is for the interests of all concerned. The employer demands and expects the best results and if you are a skilled workman you should be able to convince him, when the time comes, that it is absolutely necessary that these repairs or new parts are needed and should be attended to at once, not put off till the next month or until the time when poor work will show in the wareroom. I once worked for a man who expected the very best, but when I would go to him and ask for some repair work done he would invariably want me to put it off till next month. I would say in reply, "All right; I have run the machine as long as I can and give myself satisfaction, but you must be responsible for any poor work that comes from now on. I can get the leather through the machine all right, but simply will not take any blame." Now, he was a just man and saw my logic. Well, I always got what I wanted. The splitter, if he is a competent man, has his reputation at stake and cannot afford to let his machine run down.

A TANNERY EXPERIENCE.

I dropped into a tannery office some years ago where I was well known to employer and splitter. The latter had been running the belt knife quite a few years, and I had always considered him a first-class man. What was my surprise when his boss asked me to get him a new man; said he had gone 'way off on his work, and he could stand it no longer. Now, I surmised what was the matter, but said nothing; and after a while I suggested that I have a talk with the splitter and see what he had to say. This went all right, so I went to the splitting room and had a long conversation with him, and found his machine in very bad shape, sadly out of repair, and was convinced that nobody could do any better than he was doing. No new man coming there, if he was skilled, would attempt to start that machine in the condition it was in. When I went back to the office I put it straight to the "Old Man" (he was an old man). It seems he had kept putting off the repairs, which were absolutely necessary. The result was he took the matter in hand at once. This happened about ten years ago. To my absolute knowledge, that same man was running that machine three months ago.

"PENNY WISE AND POUND FOOLISH."

This is one instance in many where the old adage, "Penny wise and pound foolish," was being worked to the limit. One can hardly conceive how a man will deliberately neglect needed repairs, when he must know it is taking good money out of his pocket every day. If that man had been a new one and a stranger, there might have been some reason to doubt him, but he had been on that job several years and they should have attended to his demands, which he had been making for some time.

Great care should be taken in setting the top jaw after it has been newly ground. It takes some time to do this properly, but the wear depends upon your setting it right. It must be set as flat as possible so as to have the wear come back to the place where the steel is welded to the iron. At the same time the point must be tight, or the machine will run too hard and the knife heat too quickly. You understand the jaw does not set on the knife, but on the washers in the bottom jaw. All you have to do is to lower or raise the bottom screws, as the case requires, to get the proper bearing. Be sure and get these right at the start and keep them there. When you take out the top bolts hold the bottom ones with the other hand and see that they do not move, so that when you put the bolts back again the jaw will tighten down to exactly the same place again. If the knives are all the same gauge you will have very little trouble in setting the jaw when you put on a new knife. You can readily see what would be the result if your new knife should be thicker or thinner than the one

you take off, so you should insist that your knife maker should send you knives all of one gauge. The most popular gauge is sixteen, although I know of one or two parties who demand fourteen, and in some cases I have found splitters who prefer eighteen, but the latter is too thin, and the fourteen too thick, so I think the sixteen strikes the happy medium.

MISTAKES IN USE OF KNIFE.

It is all a mistake in trying to use the knives too narrow. One inch is enough, and to my mind that is too narrow, for you are wearing the point of the jaw to more than offset what you are saving in the knife. It costs considerable to resteel the jaws, and even to grind them; when you have the knife ground down to one and a quarter inches, just look at the end of the jaw and see how much knife you have left. You are wearing the point, which means that you must take up that wear by tipping the jaw. If you are located at some distance from the repair shop, where it takes some time to get work done, you should have duplicates for all the wearing parts—gauge roll, ring roll, ring jaw, knife jaws, rubber roll, grinder spindles and steps, gauge roll gear, and you should watch the other gears closely and be prepared for any break-down. Have your duplicates in readiness at all times so that there will be no delay when you need them. Also see that you have a good supply of the proper kind of emery wheels on hand. Some splitters take pride in telling how long they run their machine without repairs. Now, there is a limit to what a man can do and do it right. Then you can go along and still do work, but it is of a very indifferent sort. This is where the skilled workman's knowledge comes in—to know just what to do and when, in order to save money for his employers as well as his own reputation.

SOME DON'TS.

Don't run your ring jaw too long; it is a great mistake of many of you; some of you seem to think you must run every part as long as you can and then have a general overhauling. This is entirely wrong. The ring jaw needs planing often; it wears very fast and that wear should be planed off in order to keep your rings up to the center of the gauge roll. Any machine shop can plane them, only tell them to take the angle from the ends, which do not wear at all; impress upon the minds of the machinists the importance of this; if you do not, they may not get the right angle, and the result will be that your rings will not be on the center and will cause you all kinds of trouble.

Do not make the mistake of having your rings smaller than your gauge roll. They should be fully up to size and you will find if they caliper one-sixteenth larger they will hold the work up much better. If you will sit down and consider this, you will see the philosophy of

it all. No doubt in years back the cause of so much sucking out can be laid to the fact that you have been running much smaller rings than gauge roll, and probably some of you newer men are having the same trouble now. It is the later operators that these articles are intended for, and if you will follow up my suggestions it will be of material help to you. There is only one way to run a belt knife machine, and I am trying to show you.

TROUBLE WITH FRICTION ROLLS.

Some of you are having trouble in keeping your friction rolls turning. I mean those rolls above your gauge roll in the beam. They should not be allowed to stop long or they will wear a flat spot which will cause you much annoyance. Sometimes you have the gauge roll drawn up too hard against them. They should barely touch and should be perfectly in line and no play in the bearings. They often need cleaning out, which should be attended to. The bearings wear pretty fast and should not be allowed to go too long without babbitting or bushing, which is a very particular job, as they certainly must be in line or they will bind when the gauge roll is brought up to them.

You must be sure to have the gauge roll up to them so that there can be no play or chance for the stock to vary in thickness. Watch the screws that draw or hold the gauge roll up to them, for sometimes the jar of the machine will loosen them, thereby causing the gauge roll to drop down, and you can imagine the results if you have not experienced them. The later makes of machines now have a check screw to hold the other in place—a very good idea.

SPLITTER AN IMPORTANT MAN AROUND TANNERY.

Next to the superintendent or foreman, the splitter is the most important man around the tannery and undoubtedly receives the highest salary next to them. Therefore he should feel his duties and endeavor to do his best for his employers, and by so doing is benefiting himself, for as a rule if a splitter is giving satisfaction, he is appreciated and paid accordingly. I have seen isolated cases where the splitter did not seem to be appreciated, but these instances are rare. If you have a good workman, keep him, for the chances are if you make a change you are not doing so well, for all skilled workmen in this line have good positions, and it requires extra inducements to get them to change, and it is very costly to the employer to change, for any trivial cause, as has been demonstrated frequently.

A skilled operator of the belt knife knows just how his leather should be prepared and in a great many cases has charge of that particular work, for if his stock is not in proper condition he cannot do justice to it. I would advise all employers to give their splitters free latitude in this respect and let them have their own way as to how the

stock should be prepared. This is for the interest of all concerned and the results will be immeasurably greater for the reason that every one is working in harmony to produce the best ends. Then if the splitter cannot "make good," he cannot come back at anyone but himself. It is up to him.

TANNERY SUPERINTENDENTS AND THEIR SPLITTERS.

To my mind, the superintendent should keep in close touch with the splitter. Upon the latter's efforts depends mostly what will be the outcome of his work. The splitter is supposed to be an intelligent man and to know what kind of work he is doing, especially in large shops, where he is depended largely on his knowledge. Therefore I would advise all superintendents or foremen to cultivate the acquaintance of the splitter, for between the two of them, if there is a good understanding, the results will be much better than they would if the splitter is left entirely to himself.

In some shops that I have been in the superintendent shows that he wishes to understand all he can about the splitting department. This is as it should be. Some superintendents go so far as to learn how to feed, which is all right, for at times the operator is handicapped on account of having his helpers away for reasons, and then the superintendent can step in and do the work himself, or else teach an extra man, who should be always ready to fill up the position.

In a great many other cases I have known superintendents to take no interest in the running of the machine, and when the time came when we have had to break in a new man on the feeding side, the result would be that a lot of good leather would be cut and spoiled to some extent, simply for the reason that no competent man was ready to jump into the breach. I would recommend that all foremen looking after the splitting room would interest themselves enough to learn to feed the belt knife, so that when the time comes, as it inevitably will, they are ready to "make good." Keep your splitter good-natured; don't browbeat him for some mistake he has made; rather encourage him to the best of your ability. The job is nerve-racking, and the man responsible should have encouragement. I have broke in a good many feeders in my thirty years' experience, and I can assure you it has been costly to the firm every time, for a new man is bound to cut more or less leather. The splitter cannot be on both sides of the machine at once, so this is why I suggest that every superintendent or foreman should learn this particular point of the trade. It will not take long, and you will always feel that you have learned something of value to you and your employers. We cannot know too much, and this little trick of learning to feed the belt knife will be of much value to you.

If your splitter is a conscientious man he will do all he can to give

you the best efforts possible. If you feel that you have not got such a man in your employ, get another, but be sure to get one that you can rely on; pay him the wages that others pay, according to the amount of work to be done. Don't quibble over a dollar or two, but if the man is up-to-date, keep him; don't let anyone else, for a slight advance, take him away from you. You can pay him as much as anyone if he suits you. Don't experiment in splitters if you have one that is doing your work fairly satisfactorily.

SPLITTING OUT OF THE LIMES.

is not so agreeable; it is a wet job and requires quite a little tact to do the work properly, and should command the best of wages. I have done quite a little of it and have found that it is necessary to have everything very exact about the machine. Most of the work done of this kind is chromed for patent leather. Bark leather tannages seem to be the favorites for furniture, automobiles, carriage and saddlery; in fact, I have yet to see chrome leather made into the above class of goods. Quite a lot of tanners making the above are now chroming a certain amount of hides every week, but as far as I know it all goes into patent leather for shoes.

In the winter of 1900 I helped set up a 72-inch machine in Lochem, Holland. This tannery made a specialty of chrome-tanned belting and seemed to be turning out a very good article. All the belts on the machine were of their own make, and worked all right. The 72-inch machine is practically built the same as the 57-inch, the 84-inch has the same kind of beam, only the gauge roll has one saddle to support it, but the 106-inch is the one for me. Lots of splitters who have had a long experience on the 57-inch, which predominates as to number in use, have no idea what the 106-inch looks like unless they have seen cuts of them in the trade papers, and they would have their troubles in operating them if they should undertake to do so, for the adjustments are much different in some respects, yet the principle remains the same. I know of several skilled men operating the 57-inch who have undertaken to run the 106-inch, but had to give it up on account of a few technical points which they could not seem to see. I know of one instance in particular which happened less than a year ago, where an old 57-inch splitter went 700 miles to take a job on a 106-inch, and when he got there and saw the machine he would not attempt to run it and left town the next day.

PREFERS LARGE MACHINE.

I know for a fact that that man was a first-class man on his machine, but he had never seen a 106-inch before and it looked too large a proposition to him. The 106-inch is certainly a giant compared to the 57-inch, and I am not sure but that the man did right

in not attempting to start it; if you are thinking of making a change from the small to the larger one, it is better for you to spend a few months helping out some good operator; you have the idea, but you need some extra points necessary to carry you through successfully. I like the large machine myself, it always seems to me as though I am doing so much more, am held more responsible and the results are so much larger. I used to think it was a great thing to know how to run the 57-inch, but since I have been running the larger one the other seems a mere pigmy to me. Just the same, it is quite a trick to run the small one successfully.

SETTING OF KNIVES IMPORTANT.

Some of you may not know that it is very important where you set your knife for the thickness you are about to split. In some shops the gauges run from 3 ounces to 12 ounces. Now if you run your 3-ounce with the knife at the same place you run the 12-ounce you will get very indifferent results. First find out where your light leather will run the best and make a note of it, then the chances are your heavier stock will not run with the knife so far forward; for it is a fact that you can run closer, and must, to the center on your light stock, to get the best results. This is where you must use headwork. I have seen some splitters that thought they must set their knife in the same place, no matter what weight they were going to split. This is all wrong. Where your light leather will come the best your heavier will not split at all. The writer knows this from long experience. The way I do is to have my heaviest stock packed down first and then my lighter grades next, having my lightest on top to start with. Of course you should have a system about it, and have enough light ones to start with so that when you get them out of the way your knife will be ground back far enough for the heavier weights.

I was at a place last fall where the splitter, an amateur, was trying to buff on a whole hide machine after taking off 12-ounce collar leather. His collar leather was all right, but you old experienced men can imagine what kind of a job he was doing buffing. This same firm was paying this man about $2 per day and thought they were saving money by letting him pick the trade up. That's very nice for the man, of course. He was doing the best he knew how, but I will tell you right now that it is expensive for the owners. If they want a certain man to learn, they should have a good, competent operator to come and stay with him for a while. There has been more good leather damaged by incompetent splitting than a little, and it seems to me very shortsighted to allow it. Even the best of us have our bad days, for we are not infallible; conditions are often against us, which we have to work against and try to overcome, but as to putting an inexperienced man on one of these machines and telling him to do the best he can, it is all wrong.

I was called to a job about four years ago where a union splitter had attempted to do the work. When the old belt knife splitter quit the boss asked this man if he could run the machine. His answer was that he never saw a machine he couldn't run. Well, he found one that time, and did some miserable work and kept on doing it until he was stopped. Splitting on a Union is a different trade altogether.

A SCOTCH COMPLAINT.

Some years ago, while traveling on the other side, I was asked by a manufacturer to go to a certain town in Scotland where there was a party who had been complaining ever since he bought the machine, about a year previous, that it was not built right and had never done satisfactory work. After looking the machine over carefully I found it in good order, but the bevels on the knife were very small, which caused the leather to drag and also to suck out in the butt. The emery wheels were very fine grade and so gummed up that one could hardly get a spark from them. I explained about the wheels, which they thought were all right, so that they could get what they called a "razor" edge. As there was no chance of demonstrating otherwise, I did the best I could by cleaning them off with and old wheel, the only thing available. Then I pulled them out so as to get a much wider bevel, but not so wide as I would have done if the stock had not been East India tanned kips and very hard to cut. It took a long while to grind those new bevels with those fine, hard wheels, but after a while I got them ground down and told the splitter to put a side through. I was very well satisfied, but the boss said, "Oh well, we get one like that ourselves once in a while." I told him to put another one through, and then another, until I had split a dozen or so. In the meantime four or five were examining them very closely as I threw them behind me. They pronounced the work very satisfactory and the head of the firm told the splitter, "You see what has been done; now I want it all split like that after this."

The trouble over there at that time was that they had no experienced men, and had to pick it up and experiment, which is pretty costly to the proprietors. About three months later I saw the head man at Glasgow and he said everything was going along nicely ever since.

LEARNERS FIND DIFFICULTIES.

I have often noticed that men just learning are apt to set their knife in too close. This causes them a great deal of trouble and quite often they don't know what is the matter. Finally after grinding a while they will wear the knife back and everything will be lovely again, till the next time. Some of them will have the knife set so that it will bow in the center. This should not be so. The knife should be

perfectly straight. Years ago we used to think that it should be the reverse, but we have got over that notion. Some of us had the knives made especially for us, long on the back, and we did not agree always in regard to the length, so makers used to keep tab on us as to just what we wanted. The makers of the machines years ago used to turn the knife pulleys one-sixty-fourth taper, from flange out, but now they are all turned flat; the old way partly accounts for our wanting the long backs to take up this taper.

What trouble we used to have years ago, when we thought we must run all those gears on the idler end. Now it is rare to find anyone using them; they not only make the machine more costly, but they are absolutely useless. I see some of the later makers are leaving them off entirely, and it is a good idea, too.

GERMAN TROUBLES.

When I was in Germany some years ago they sent for me to come to Frieburg, in Saxony, where there is a technical school devoted to the leather business. They had a 106-inch, or whole hide machine, "made in Germany," and they hadn't been able to do anything with it for some time and the whole trouble was on account of those gears on the idler end. They had run the beam up out of gear and when they run it back the gears did not mesh properly, and there they were. And nobody had been able to find out the trouble. The result of this was that the rubber roll would jump up and down and no work could be done under those conditions. I took off one of the gears and at once everything was all right. Then I told the head professor to keep it off, which he thought was all wrong, but before leaving he was convinced, after showing them. There were between fifty and sixty students watching me; they thought it all so simple, like Columbus breaking the egg. It is easy when you know how, and to know how your must have the experience. About all the civilized nations of the earth were represented in that group of students. Only one American, who acted as my interpreter, as I could speak no German. I spent several days with them and had a very enjoyable time.

WIPERS RECOMMENDED.

Regarding the lubricating of the knife, we old pioneers used to think we must use nothing but kerosene or coal oil, but in late years I don't think I have used one can of it. I have found a better method. In the early days the wiper had not been introduced. Now we are all equipped with them; some of us use two or three; two is enough I think, one at the top where the knife enters the jaw and one at the bottom, where the knife enters the grinder jaw. When the wiper was first introduced we used to use a thick felt and a great many are still using the same. What I have been using the past few years is

common waste, saturated with machine oil, such as I use about the bearings. You must be careful not to use too much, especially on the under side which runs on the pulley, or you will have trouble with the knife slipping. It is well to have a good dry piece of waste handy to rub the pulleys occasionally. If you do not the chances are at times that the knife will stop in the cut, causing you a great deal of annoyance. If you are running the machine constantly all day it is well to change the waste twice a day, and sometimes oftener if the stock is very wet. Watch the face of your pulleys constantly and wipe them as they need it and you will have no trouble and won't have to be always squirting kerosene as in the old way. You will find the knife will run easier and quieter also.

Some years ago, a young man who had been tending a machine for some time, and whom I knew very well, came to me and said his employer had offered him the job providing he could get an experienced operator to look after him. We came to an agreement and for some time he got along quite nicely. I did not have to go to him very often, for he had a pretty good idea of the machine. But one day I got a 'phone from him to come to him at once. He was all discouraged, could do nothing with the machine, and was ready to throw up the job. I had to make a drive that night of about eight miles to where he was located, and it was one of the coldest nights in winter—about ten below zero. I had not been with him five minutes before I discovered what the trouble was, and had him going again. Just one-half turn on one of the screw bolts that holds the gauze roll up and everything was all right again. It had loosened and worked down. and that fellow could not see it, and the result was his leather coming every which way. A more delighted man you never saw, and I will guarantee he has watched those bolts since. There must be no play in the gauze roll at all—it must be perfectly rigid.

OVERHAULING THE MACHINE.

Less than a year ago I was called to a certain tannery where there were two machines, operated by inexperienced men, who were doing some very poor work. On questioning them I found that they had not overlooked the machine since they had put the knife on; in fact, had not run the beam up at all, to see if the knife was still tight. Their stock was coming very uneven, and on trying the knife I found it very loose in the jaws and they were getting the same results as the other fellow whose gauge roll was loose, so you see it is not always one cause that will produce the same effect. I always go over my machine every morning to see if the wear and tear of the previous day has affected the different parts. I want to feel sure that everything is all right before starting up.

If your machine is doing good work, leave it alone until such time

as it needs overhauling. Some splitters seem to think that every spare moment they have they must be pulling some part of it to pieces. "Let well enough alone," and don't be making trouble for yourself where it is not needed. An experienced man knows when it is time to overhaul, but there are lots of inexperienced men who, if they would be content to keep their hands off the machine when it is going all right, if they will take my advice they will save themselves lots of trouble and, many times, their jobs.

The information here given is intended for the beginner, although I trust I am offering food for thought to the older ones.

Some of you are having trouble with the knife chattering, or, as some call it, corduroying. This is caused by one emery wheel striking the knife harder than the other, or possibly the wheels are not perfectly round. Either condition will produce the same result, and this is where the hard, fine wheel causes lots of trouble in this particular respect. A coarse, soft wheel keeps itself clear, the hard, fine one you have got to keep clearing all the time, and often get it out of shape, and the result is you do not get a good clear cut.

For lacing the grinder belt I much prefer the hooks; they are more convenient and do not make so bulky a job as the leather lacing. About a No. 8 is the proper size. They can be obtained at any hardware store or through your dealer. Be careful not to leave your angle irons bear too hard on the gauge roll. A great many rolls have been broken for this reason alone. You should use your wrench frequently while adjusting the irons and see that at all times your roll turns easily; but have the irons close enough so as to allow the least possible dirt in back of them. There is no particular rule as to how often these irons should be taken off and cleaned out. This should be left to your own judgment. If the friction rolls continue to turn freely, you are reasonably assured that they are not dirty.

TROUBLES WITH RUBBER ROLLS.

What troubles we used to have with our rubber rolls years ago! In late years they seem to have overcome these and most of the manufacturers are giving us a good grade of rubber. The white rubber seems to be the most preferable and to have the wearing qualities. Some twenty years ago we thought we were doing well to run a rubber roll three months. In later years I have run one two years and to all appearances it was as good as the day it started. Of course it depends a great deal on the stock you are splitting. If it is full of animal grease which comes in contact with the knife, the roll will not last long, for there is nothing so detrimental to rubber as oils or greases. Where you are bothered in this way a liberal application of sulphur will kill the grease and help the rubber.

REMINISCENCES OF A SPLITTER.

When I learned the trade all machines were run at about 240 revolutions a minute, now one seldom finds one running less than 300 and most of us prefer them much faster, about 400 or 450, not because of an extra amount of work we have to do, but because the machine really does better work, for I believe the quicker the leather gets through the machine the better results are obtained. Of course, much more work can be done also and it saves having an extra machine or two. I have seen machines speeded up to 700, but it was reduced again very soon on account of too much jar and vibration.

About seventeen years ago I went from one job to another. The machine that I left was running at 300 and I had got quite used to it. When I started the machine on the new job I thought the engine was running away, the motion was so much faster. I shut it right down to investigate and found that it was all right, that it was speeded up to 450. It took me quite a few days to get used to the faster motion and I got to like it much better. Of course I had to work considerably faster and consequently finished my day's work sooner, and as I was allowed to go home when my day's work was done, it helped me out quite a little.

VARIETY OF WORK.

You splitters who have been out of your own town but very little, and there are quite a few of you, have no idea what the "belt knife" is doing today. It is splitting felt for making felt boots. It is splitting out of the lime, mostly for chrome tannages; it is splitting out of the pickle, mostly for glove leather tannages; it is doing very nice work on dry leather, which is just finished in some of the most delicate colors. This kind of leather is first split as usual, only about 8 or 9 ounces, so as to get a good coarse pebble, to imitate seal, then after it is finished the grain is split off very light for pocketbook or bag leather. The other part makes up very nicely into blacksmith's aprons.

Then there are the dry "pancakes" which are made in a mold from the offal or trimmings off of all kinds of leather pressed very solid and then dried. Sometimes they are three-fourths of an inch at the start.

Both sides are split off to make a shoddy innersole when finished, and one strikes all manner of substances that spoil his edge as well as his temper. After these two sides are split off they go back to be recovered on one side, and the other part goes back to have the same thing done to both sides and after dried, it again goes to the splitting machine, and so on until it has been all split up. The material used in making these "pancakes" most of it has to be leveled through the machine, sometimes passed through three or four times before it is

thin enough to work. I know quite a few of these "pancake" shops that have two or three machines busy all the time. No other kind of splitting machine can do this work; in fact all these new methods have come in vogue since the belt knife has come into existence, and quite a few of them are of recent origin. Ten years ago who was splitting out of the limes or pickle? I first saw this work done in Germany in 1900 and they were having quite a time of it, too, for they were using the smooth rolls as are used for tanned stock. I have seen over there twelve men on a 106-inch machine, four feeding and eight pulling out. Today there are a lot of tanners who are splitting out of the limes, but are using the corrugated rolls and rings which are absolutely necessary for this kind of work. I presume they are now using them on the other side also.

SPLITTING OUT OF THE PICKLE

when the stock has been pressed and milled, is nice work, and there is one thing about that kind of stock, it can lay around for an indefinite time and not spoil; in fact the longer it lays, the better condition it gets. I have seen some of it lay for three months and then be in fine shape to split. There is some very nice work done on sealskins after they are finished. They are split down very light for pocketbook leather, bookbinding, etc. I have also seen some excellent work done on goat, sheep, etc., after they were colored and finished into the most delicate colors. The machine has to be absolutely clean to do this work in order not to soil the finish.

There are several places in the United States where they are splitting whole hides with the hair on for robes, rugs and that class of goods. These are split principally before they are tanned, the hides are specially selected and laid one side by the packers for this trade. They must be long-haired and perfect in every way, and command a fancy price. Sealskins are often split or leveled on the belt knife with the hair on. Hogskins are now being used for the manufacture of gloves and either in the pickle or tanned state are split very nicely on this machine. I was splitting a good many years before I had a chance to see what the belt knife could do, then I had an opportunity offered me which enabled me to get among the different tanneries, and what I have seen since has been a great revelation to me as well as very instructive.

Chrome is nice leather to split, as well as handle. It is clean and there is no offensive smell to it. It is coming into use extensively and undoubtedly is here to stay.

TROUBLE IN LEVELING BULL HIDES.

A great deal of trouble has been experienced in leveling bull hides through the belt knife. The machine should be set purposely for this

kind of work. The rings should be set about one-eighth of an inch from the edge at the start, and there should be enough leeway so that when the thick shoulder and head comes along, the rings can be lowered considerably more; to allow them to pass through comfortably without binding, the feeding board should also be set low enough so that the heads will have clearance between them and the guage roll; if not, the leather will choke in the machine and require a good deal of pulling to get it through. The writer has know of several instances where the gauge and rubber rolls have been sprung or even broken by not conforming to these ideas. I think that this kind of work is harder on the machine than any other. I have seen men pulling and tugging, sweating and swearing, because they did not know enough to lower the rings at the proper time. At some places they run the hides through twice in order to save the strain on the machine. This is all right if one has the time, but in most cases time counts for a good deal. Union machine splitters are very averse to handling bull hides, for it is very hard work for them and they are glad to have the belt knife do them, if there is one in the factory. Especially is this so on whole hides. I know several places where there are nothing but Union machines in the shop, where they send their bull hides out to someone who has a belt knife and who makes a specialty of splitting for the trade. These people make a very good thing out of it.

Some of you side splitters who are working on shoe leather have an idea of the large French hides which are imported into this country for making carriage, furniture and automobile leathers, some of them measuring over 80 feet when finished. These are all split on the 106-inch machines and are very heavy to handle, as they not only have the spread but the thickness. One generally gets five pieces out of one of these hides—a buffing, machine buff, main dash, second dash and a slab of good proportions. It is nice work splitting this class of goods and the operators command the highest wages.

WHOLE HIDES BETTER THAN AVERAGE SIDES.

Whole hides are much better prepared than the average sides. They are fleshed much closer in the beam house; in fact, are practically green shaved, which helps them to take the liquor much quicker, and saves the necessity of skiving when they reach the splitting room. They are also trimmed up much closer, which to my mind is all right, for the offal taken off in the beam house goes into glue stock, while if it was tanned it would have to come off anyway, and most of it go under the boilers or sold for little or nothing, leaving alone having to tan it. After the hides come from the press I like to have them hung up for a few hours, according to the temperature, so that the loose spots, which are bound to contain more moisture, may have

a chance to dry out. Then I like to have them packed down for two or three days to sammy out, then prepared for stoning out. The results are so much better that it well repays for doing it. In passing from the press question, I wish to say that quite a few bark tanners are running the liquor from the press back to the junk. If you will notice, it does not take more than five minutes after the press has begun to work until the liquor is almost as colorless as water and is merely the water which entered the hides in the beam house. There is more good liquor lost in the leech house by leakage than will more than offset this absolutely bad stuff that comes from the press. While this does not concern the belt knife, I cannot help referring to it in passing, for I have seen so much of it. A practical man can often see things going on about him and of course is apt to form his opinions, which do not always coincide with the "powers that be" and it is not always best to express them, unless it refers directly to his own work, and then he has the right. A good splitter should always have his eyes open to everything going on about him. He can at times materially help his own work, and also the interests of his employers, not by any underhanded work, for that will always militate against one in the long run. I have been able at times to make suggestions which were of real benefit to the firm and by helping them I was only increasing my own value. While it isn't considered good business for the boss to come up and pat you on the back and tell you what a good splitter you are and how much he thinks of you, at the same time he notices all these little things that you are trying to do to better conditions and the time will come when he will show all his appreciation. Lots of good, conscientious splitters have advanced themselves to higher positions. Be true and loyal to your employer and you will be true to yourself and reap your just reward. The writer has been moralizing to some extent and I trust to some purpose also, for there are splendid chances for a splitter to better himself if he improves his opportunities.

TROUBLE WITH KNIVES.

Some of you are having trouble with your knives slipping on the pulleys. There are several causes for this. One is you do not have it strained tight enough; you are afraid of breaking the knife; probably you have broken some, or else you are afraid of breaking one of the shafts, which perhaps you have done in the past. Another cause is, you put too much oil on the knife and if the face of the pulley has been worn smooth from long usage, the knife will not hug so close and requires a tighter strain. You need not be afraid of straining the knife too tight if you will have it lined up straight. The trouble is with some of you, you do not keep the pulleys lined up properly. A belt knife will stretch like any other belt and after you have run it

a few days it is liable to slip like any other belt, and the stretch should be taken up on the idler pulley. Never touch or try to move the shaft on the power end after it is perfectly adjusted. If you do you are liabel to get into trouble. That shaft is not supposed to be meddled with. When you take off a knife loosen up the idler end only and throw the pulley back as far as you can. This will give you ample room to take the knife off and put the new one on. It is a nice thing to have the face of the knife pulleys turned occasionally, for they wear more at the flange than at the front edge for the reason that there is always something there to wear. When they get worn too much it brings a different strain on the knife and often causes the same to get out of shape and run crooked. Many a good knife has been spoiled for this reason and had to be taken off and often returned to the makers with a demand for a new one to replace it, often because the operator was not experienced enough to know what caused the trouble and how to remedy it. I saw a knife condemned as being too soft just because a particle of emery got between it and the jaws, causing a slight scratch. This is liable to happen to any of us and can be easily remedied with a file.

GIVE WORK THOUGHT.

If you will only have patience and adapt yourself to circumstances you can make your knife run all right and use it up. One cannot always go by a certain rule, and there are ways to overcome certain difficulties on a belt knife if you will only study the matter out. Don't be hasty and condemn a particular part because you are having a little trouble. Just give it some thought. I have seen men when they were having trouble, and it comes to the best of us at times, who would shut down the machine and go and sit down for hours trying to think it out, and would eventually do so. That is the only way to do. I have seen others who, after puttering around a while, stand back and throw the wrenches at the machine with a large vocabulary of curses, put on their clothes and go home. The next day they would come back, adjust a few parts and everything would start off lovely. I have used all sorts of knives in my time and the makers have always got their money for them. At the same time I had my preference and always managed to get the make I preferred. The splitter likes to have the make he prefers and I think it is good policy to consult him and not try to force something onto him that he thinks is inferior.

I have always tried to use my helpers considerately, for their efforts go a long way toward helping one out in the day's work. Of course there are some men you cannot use decently, for the more decent you are the more they will impose on you, and I am not long in getting rid of such ones. I had one helper long years ago. He was with me for about five years, and I don't think that during that time a disagree-

able word passed between us. Enough to say that he now has a nice position as a splitter, and will tell you whom he owes it to. A great many helpers have advanced themselves to splitters by trying to do their utmost to help the operator.

USEFUL HINTS TO SPLITTERS.

There is quite a trick in setting the grinder spindles and steps so that they will not heat or bind. The old-fashioned steps used to be made of steel, but we see none of them now, as they are all of composition and are much better. I have seen the old ones get so hot that they would absolutely almost melt together, and what a job we would have to get them apart and fixed up again. It is not well to have too snug a fit. Leave a little play so that the oil can work freely. I have always found it is nice to have small oil cups on the steps, self-oiling. You can have these put on by your local machinist or by the factory millwright. By having these cups you close all places where the emery can work in, and thereby save the wear of the parts.

Very often when the grinder belt breaks it strikes the knife and gets a bad cut. This can be obviated by having a sheet of tin or iron adjusted to the grinder jaw so that when this happens it will protect the belt and prevent it from coming in contact with the knife. One of the nicest ways to do this is to fit a piece of board into the space where the back plates are, cover it with tin and have the tin extend over the knife well under the pulley. This will absolutely protect the belt when it breaks.

Some years ago I required a new gauge roll and ordered it from the local machinist, who made a specialty of repairs and duplicate parts for the belt knife. I had the utmost confidence that I would get an A1 article, for this party had a reputation of doing first-class work. I worked for hours trying to make that roll good, but could do nothing with it, and finally I put the calipers on it and found that it was one-sixteenth larger at one end than the other. I called the machinist, or the head man, and showed it to him and for years after he was explaining why that roll came to be in such a condition. He had an apprentice turn that roll and never examined it after it was taken out of the lathe, assuming it was all right. It caused me a lot of trouble and time, but it was an incentive for him to watch his work closer.

CARE IN MAKING REPAIRS.

I like to have my repairs done by those who know how to do it and do it right. I do not like to have an ordinary machinist at work on my machine. It is far better to send the parts to the maker than

to have some stranger tackle the job and make a mess of it, for these parts which need repairing have to be delicately adjusted and if they are not properly repaired will give one a great deal of trouble. I have seen jaws ground so badly that they could not be used at all and had to be sent back to be ground over. This is a very particular part of the work and the jaws have to be ground absolutely true, in order to get the very best work. I have sent them a thousand miles to be ground rather than take any chances of the local machinist doing a bad job on them. The planer on which they are ground has to be especially fitted up for the work and it requires very nice work to get them in proper shape.

HISTORY OF THE BELT KNIFE.

The history of the belt knife splitting machine is quite interesting to those who are concerned about it. The first machine appeared about fifty years ago and was a very crude affair and gave much trouble in operating, for the operator had to pick up all his knowledge, and consequently did a lot of damage, the machine was constantly getting out of order, and I have seen them idle for days before they could get them into working order again.

The first machine was on exhibition at the Mechanics' Fair in Boston, Mass., and bought by a prominent tanner at Woburn, Mass. It is running yet at Newark, N. J., where they are splitting offal on it. It is not the same machine, however, except the frame, for it has been practically made over for a good many years. There are a few of the same design still doing work, but most of them have been consigned to the scrap pile.

The jaws were very poorly designed, the bed part had to be bolted to the end blocks without the assistance of the lugs to hold them in place, and it was hard work when they were adjusted to keep them so, for the jar of the machine would often cause the bolts to loosen so that it would drop down or forward or back out of the proper position, so that in a few years a new one was perfected, but this style did not last long and we are now using about as perfect a type as can be thought out. In the first two styles the back plates were set in slots the same as are found in the grinder jaw today; there were the same number of plates, and they had to be adjusted just so or they would get under or over the knife and cause all kinds of trouble.

There was another style of jaw made by the Barton Company, now long out of existence, called the wedge jaw. I ran one of the machines for three years and got so I liked it very much. It was made the same as the American tool with the exception of the jaw. The wedges, seven in number and about 4 inches long by 2 inches wide, were placed between the back plates, four in number, and the top jaw

rested on them, which were moved in and out by screws placed between the back plate screws in order to tip the jaw when it began to wear. There were three sets of wedges, each set tapering more than the others. I used to use only two sets, however, for I found that when it was time to use the third one it was time to have the jaw ground.

The man who took my place on that machine did not seem to like the jaws and soon had them made over into the prevailing style.

The original grinder apparatus was a unique affair and did not last long. They consisted of steel plates on the face of which were glued emery cloth. These plates were adjusted to run nearly flat and made a very wide bevel, as you can imagine. The emery cloth did not last long and had to be often replaced. I never had any experience with them and only remember them as a boy when I used to watch the machine run.

The present supports to the ring jaw are a great improvement over the two former styles and cannot be improved. The first style was a slender rod in two sections connected in the middle by a right and left nut; quite a few of these are in use today. The second was simply two castings, one bolted to the jaw, the other to the bed of the machine; these are bolted together, and if one wants to spring the jaw he must use a crowbar or something similar.

On the original type of machine the knife runs in the opposite direction than on the later, and are made some wider; about 3¼ inches is the prevailing rule, although some can use 3⅜ inches, especially the larger sizes.

The machine I learned on was also bought at the Mechanics' Fair and was the first one of its type sold. It is very much the same as the more modern, but lacking quite a few of the improvements. In those days the beveled gear and pinion were made of cast-iron and were very noisy. Now they are all giving us cut-steel beveled gear and either a rawhide or composition pinion, which makes the machine run nice and quiet.

The belt knife has always been a great curiosity to those seeing it for the first time. I remember starting a new machine about eighteen years ago in a small town in Pennsylvania. The management were very liberal in allowing visitors around, and they used to form parties to go and see the splitting machine. I remember one native, however, who made the remark that anyone could run that machine who had ever had any experience on a band saw for sawing lumber logs. At that time I had never seen a band saw working, so as there was a large saw mill near by I took the first chance to go and see it. Well, I never got the impression that I could run one of them. That same tannery in two years' time had four belt knives running steadily the year round.

LARGE FOREIGN TRADE FOR BELT KNIVES.

The foreign trade for belt knives has assumed large proportions in the last few years and are now all over the world where leather is split.

Some fifteen years ago I was sent to Europe by an eastern concern on account of my supposedly practical knowledge of the belt knife. One of the firm was over there three years previously and saw that conditions were such that a practical man could "make good" in various ways. I found things very crude over there, and they certainly were lacking the "American way." I was over there five months and my efforts at that time were appreciated to the extent that I was sent over again seven years later and remained eight months. During the interim of seven years great advances had been made. We had an agent in Germany who was just starting putting out machines. I think they had sold seven the first time calling on them. My second trip revealed the fact that they had over ninety in use and hardly able to fill their orders; were shipping them all over the world, and the large majority of them were the large whole-hide ones.

OPPOSITION TO THE BELT KNIFE.

When the belt knife first came into operation, and for years after, there was a great deal of opposition to it, for several reasons. It was so unreliable in its work that the large majority of the manufacturers did not care to invest the money and takes the chances of spoiling so much leather. Then, again, they were, individually, doing a much smaller business than today, and felt that they could not afford to put so much money in a machine and allow it to lie idle so much. For this reason alone, the smaller ones kept on with the old-style machine.

The east was away ahead of the west in taking up with it. There seemed to be a strong prejudice in the west against it, and for years there were very few machines in operation west of the Alleghanies. I remember well, when I was splitting in a factory near Boston, in the early 80s, a party interested in the machine got a large western concern to send twenty-five sides to my town to be split for a test. The party to whom they were sent would have nothing to do with them, so I was interviewed to see if I would do them. Of course I could do nothing without the consent of my employers. They, however, were quite willing I should split them. When done, I had my two employers inspect them, as well as two splitters, friends of mine. They all pronounced them split as well as could be expected. I was well satisfied with the work I did on them, and shipped them back just as they came from the machine. It was some time before I heard from them, and their report was that they were the best they had ever yet seen split on the belt knife. That factory now has four or five machines in operation.

THE NEW MACHINE AN IMPROVEMENT.

Western tanners used to claim they could get 2c more per foot for sides split on the old-time machine, but competition and enlargement of operations have forced them to use the belt knife; their claim may have been well based twenty-five years ago or more, but the belt knife today is doing work, with a skilled operator, equal to any ever done on the old-style machine. Why, I remember when I first went to splitting that it was considered necessary to shave every side after it was split. Nowadays how many are having their leather shaved? The splitter is expected to do his work so well as not to require it. Of course this naturally threw a good many good men out of employment, but it is the natural result of the introducing of improved machinery, and the strife among competitors to decrease the cost of production. One of my old employers used to say that there was now no secrets about the leather business except how to get it out cheap in order to meet competition. The belt knife has certainly gone a long way to reduce the cost and at the same time with no detriment to the leather; in fact, it has been an improvement to the extent that there is undoubtedly more measurement gotten from leather split the new way than the old.

It took years to accomplish this, but the facts prove my statements. I have worked in shops where there were both kinds of machines. The leather for the old-style machines has to be trimmed very close, and even then there is lots of waste on the split, which is all saved on the belt knife. In these days when every foot and pound counts, the odds are greatly in favor of the belt knife. This has come to be generally understood, and the newer idea is fast superseding the old. In fact, it would be impossible for some manufacturers to do business without the belt knife today. Methods have changed so the past few years that it is absolutely necessary to have the belt knife, and it is on account of this same machine that it is now possible to split out of the limes and pickle, which the old style cannot do; even the belt knife was never intended to do this kind of work, but by making some changes in the rolls it is now possible to do very nice work.

THE LEATHER GAUGE.

I was splitting quite a few years before the leather gauge first came out. Everyone seems to think now that they must have a gauge to determine the thickness they want to get; yet we old-timers used to get along very comfortably without them. The first one I ever saw was in the year 1890, when I was splitting in Pennsylvania. I had been there about six months, when one morning the boss came to me with one of the dial kind; in fact, the first make put on the market. There had been no complaint as to my thicknesses, but the man in Boston had been prevailed on to buy one and send it out to the tanner

with a paper with written instructions. Now, I was a busy man those days; had all I could do to do my day's work, and did not look very favorably on the thing, and the boss was pretty much my way of thinking; but as long as it was there we thought we would test it on a few sides and see how we compared. After trying, say, a dozen, we found that the machine tallied with me, but also saw that it was more or less of a nuisance, and as my work had been satisfactory, he says, "You don't want to be bothered with this," took it back to the office, and I never saw it again. However, the gauge has its uses and I would not condemn it; but the thing can be manipulated in such a way that it often causes controversies between the boss and the splitter. You all know this. I would give more for my thumb and forefinger to get the substance than all the gauges made. Some of you, if there seems to be a variance of a quarter or even a half ounce, get scared, and think you are away off.

No man can take one hundred sides or hides and get them exactly alike, for the reason that conditions are not alike in every side or hide. A good plump side will run nice and even because you have had the knife buried in the cut, and there was substance enough to hold the work up. A poor thin cow hide will split more or less indifferently for the reason that it is thick and thin in spots, so that you get poor results as a rule. A practical splitter likes to work on good plump hides, where he can make a cut that will take off a good split; by so doing he has substance enough to hold the knife up to its work, and he gets a much evener grain on the first cut.

Lots of these points are not understood by the beginner, and they often wonder why they cannot get every side or hide just alike. The man is not living who can do it; the only way to do is to sort your work out and split the hides according to what they are fitted for. You cannot make a "silk purse out of a sow's ear," so do not try to make No. 1 leather out of No. 3 hides. Do the best you can with them always, and when you have such leather, call the boss' attention to it. Show him you are doing the best you can under the existing conditions.

SUCCESSFUL WORK WITH THE BELT KNIFE.

About ten years ago I set up and started a whole hide machine in one of the central states. The shop was a small one, and nothing but collar leather was made. They had been shaving the hides to the substance wanted, thereby losing the split and lots of good money. One of the sons made a visit to one of the large tanneries located about one hundred miles distant, where he saw the belt knife working. He was so much impressed with it that on arriving home he immediately ordered one. His leather was very nice, plump, oak-tanned stock, and we were able to get some very nice splits, something he could sell, and I venture to say the machine paid for itself in a year's time. I was

with those people about a month, instructing the son as far as I could in that time how to run it, with the understanding when I went away that if he got into trouble he should write me. Not having heard from him since, I assume he managed all right. He was delighted with the splits he took off, for previously all the shavings went under the boiler—a dead loss.

WHERE THE SPLITTER'S SKILL COMES IN.

It used to be interesting to me to get around among the different splitters and get their views and ideas as to the general management of the work. While we did not always agree on all the technicalities, at the same time our conversations were no doubt instructive to all of us. I know I picked up quite a few points, and was often able to give some. It is when the machine begins to show signs of wear that the splitter's skill comes in. Most any one can take the leather away from the machine when it is coming through all right. And even then everything has got to be carefully looked after, especially the grinding of the knife, which should be uniform all the time. I have always claimed that one-half is in the grinding. The knife must have a keen cutting edge all the time. If not, the stock will have a tendency to gouge and run more or less uneven. I feel that I cannot say too much on this particular point; I have hinted about it previously, but will still repeat it.

WHEN SPLITTING OUT OF THE LIMES,

it is impossible to tell by the sparks just how hard you are grinding, for there are none, the water on the edge keeping them down, so one has to tell by the sound. Lots of beginners do not realize these facts regarding the grinding, and often, when the work begins to come bad, lay it to something else that they think is wrong about the machine, such as a loose knife or roll. In fact, the beginner often gets "rattled" when things begin to go wrong and he is often "all at sea" as to what is the matter. Some of you have to study it out; others have friends whom they can call on. If you are filing these copies of HIDE AND LEATHER away for future reference, they will be of great help to many of you.

One of the greatest nuisances is a hard rubber roll. I have seen them so hard you could make no impression on them at all with the thumb, which is a bad state of affairs, for the leather feeds very poorly with such a roll, especially if wet or greasy. Where conditions are like this it is necessary to use sulphur or bark dust on the roll in order to make the stock feed at all. I have also seen sumac used when nothing else could be found.

SKIVING HARD ON MACHINES.

Skiving is harder on a machine than any other kind of work, and where there is any amount of it to do it should be done entirely on one machine, and that machine is a good place to use up the rolls and grinders when they are discarded from the splitting machine, for the work is not so very particular, and the half-used rolls will answer every purpose. This will tend, where there are two or more machines in the splitting room, to keep the splitting machines up to the best conditions. I think the way the carriage and automobile leather manufacturers flesh their hides in the beamhouse is the only way, for there is no need of skiving on those hides after they are tanned. There is no surplus flesh to tan, and what they take off in the beamhouse can be sold for glue stock and something realized on it. To be sure, the skivings can be sold for little or nothing generally, and even then there is lots of waste to go under the boilers. I have seen skivings used to build roads around the tannery where there were lots of mud holes to fill up. Some tanners are so far from the market that it does not pay to ship them away, for the freight is more than what could be realized on them. Skiving can be done on no other splitting machine but the belt knife.

Miscellaneous.

THE SUCCESSFUL TANNER.

In these twentieth century days the successful tanner must needs be temperamentally well balanced. He must have a bump which leads him into investigation and research, but he must also have a well developed bump of caution.

It is no doubt true that the time is come when tanners, to be successful, are obliged to make more or less chemical researches. But nature herself is the mother chemist, and to change her natural way is impossible. The more a chemist experiments the more is he convinced that he must follow nature's laws. He may assist nature to a certain extent, but to change her laws is another thing.

TANNERS NEED A CHEMICAL REACTION IN THEIR ART.

Tanners need a chemical reaction in their art. They get it. Sometimes they get more of it than they need, but this is through their ignorance as to how and why these changes take place.

A chemical reaction of their liquors is needed at one stage only, and that is during the plumping of the stock in the liquors. Here the tannic acid does not play so important a part. It is the acetic acid together with the other precipitations that causes the plumpness. On this point tanners have been wavering back and forth for a long time. How far they should go to obtain the best results, is the question. They know that in using sour plumping liquors they obtain various results. Sometimes their leather shows a good gain in weight and plumpness, and again it shows a loss in weight and of a loose texture. This has for a long time been the experience of tanners, and it will be until they are able to determine with exactitude the extent to which fermentation has gone. A liquor used for plumping the green stock today may be in acids at the proper stage. Tomorrow it may have passed that stage. Pumping such a liquor on the spent leach of bark clarifies it to some extent, but no chemical will help a tanning liquor after the stage of fermentation has been reached.

A chemist may sit down and in his mind picture certain things, formulate certain theories in which he can see no flaw, but when he attempts to practically demonstrate those theories in his laboratory he

runs up against obstacles which upset the theories. The practical work proves to him the fallacy of what in his mind's eye was absolutely perfect.

THEORIES VS. PRACTICE.

There is considerable difference between beautiful theories and practical knowledge—between the theoretical and the practical tanner. If the man with theories and without practice does no more with his theories than to carry them out beautifully on paper, he suffers no loss and no inconvenience. But the trouble is, the fellow with the theories may express those theories of his so beautifully that some poor tanner fellow whose bump of caution is perhaps not quite what it should be gets bitten by them. When he starts in to demonstrate the theory he may have theory plus a good bank account. When the theory has been demonstrated he may have theory plus practical demonstration minus a good bank account.

TANNING HIDES FOR UPPER LEATHER.

In tanning hides for upper leather by the chrome process tanners find that if every department is not closely watched and every detail carefully carried out, the finished leather is either bony or flabby, and the successive lots are not uniform. Mistakes made either in the beamhouse or in the tannery can not be remedied on this class of stock. If limed too long it comes out flabby and coarse, and if limed too low it is of tight fiber and feels raw when tanned. Too low limed stock always works hard all through the works from the cellar to the finishing room, taking nearly double the amount of time and labor to color, stake and season it.

IN SOAKING GREEN SALTED HIDES,

clean and fairly soft water should be used and the hides should be fairly soft before fleshing on the machine. If the hide is not in proper condition to flesh, the blades on the cylinder can not take hold and flesh all parts alike. Such fleshed hides on being returned to the soaks do not soak evenly and cannot be limed uniformly, and when tanned the leather is hard and tinny in spots.

Hides well soaked, well fleshed and free from filth take the lime liquor rapidly and the hair sheaths start in much less time with the use of much less lime than do the hair sheaths on hides that have been not half fleshed and put into the limes in a filthy condition.

Experience has taught tanners that in liming hides for chrome leather it is much better to use sulphide of sodium in the lime liquor for starting the hair than to use it on the hides first and lime afterwards.

In using sulphide of sodium—which is manufactured from muriatic acid—alone, the swelling of the hide is too rapid and when the hide is placed in the limes the grain is made more or less rough. Such stock, when bated, shows too much looseness of fiber.

To hold the tanning material and to have a certain amount of elasticity to the leather, the hide fiber must be split up without losing much hide substance. If starting the hair were all that is necessary, there would be no reason for using lime liquor, since the hair can be removed in a shorter time at less expense.

FILTH IN THE BEAMHOUSE.

One of the worst foes in the beamhouse is filth, and if the soaks are not kept clean the limes are made foul in a very short time. The hides are in a state of putrefaction on going into the limes, and even under the best of conditions the lime liquors are charged with organic matter from the decaying flesh, and this necessitates a frequent running off of the limes and the making of the liquor anew. For a uniform run of chrome-tanned leather, each pack of green hides coming from the beamhouse must be depilitated as nearly like the preceding packs as possible. The only way in which a uniform run of hides is made possible is by the use of sulphide of sodium in the limes and the throwing away of the liquor every other round.

WHICH IS THE BEST METHOD OF BATING HIDES?

There is a difference of opinion among tanners as to which is the best method of bating hides for chrome leather. Some claim that a bacterial bate gives the best results, since by its use a fine break is given to the grain of the leather, and they also claim that by its use the hides tan more easily, being more open. Others claim that an acid bate is cheaper, more uniform in its action, and that by its use just as fine grained leather can be produced as with a bacterial bate; but all believe in having the hide perfectly clean before it receives any tanning.

On coming from the bate the hides should be well washed in the paddle wheel. The cold water cleanses them, stops putrefaction and puts them in good condition for the tanning.

At this point in their transition from hide into leather they have reached an important stage, whether intended for bark or chrome stock.

Tanners of bark leather as a rule used to believe that as soon as a hide was drenched it must be placed in the liquors or it would spoil. But this theory was exploded when an enterprising tanner put into his works a paddle wheel and paddled his drenched hides in cold water for 24 hours before hanging them on the rockers. The cold water not only cleansed the hides from all filth, but it plumped them, and

on going into the bark liquors the grain was rigid and in condition to stand a fair strength of liquor without being drawn. By the use of the wash wheel the liquors were kept sweet and clean, thereby saving a large per cent of tannic acid.

THE WASTE OF TANNIC ACID

caused by taking green hides from a drench in a half-washed condition, hanging them in the liquors, and then pumping that liquor on the leaches, is no small thing, yet this is often done, and to tell some tanners to pull the plug and run such old liquors into the drain is a waste of time.

The point argued by them is that in such liquors the green sides are plumped and made mellow by acids which are not found in a new liquor. While it is true that a fresh-made bark liquor started from water contains very little plumping material, and that it takes time for plumping acids to develop, there is always in a liquor yard plenty of liquor at the right stage for plumping the green hide.

The trouble has been, and is now, that in a liquor yard the acids that are developed by the action of the air and by organic matter from the green hides kill a large amount of the tannic acid in the ground bark.

TANNING HIDES BY SUSPENSION.

It is noticeable in tanning hides by suspension that the best results are always obtained at the start, when the liquors have been freshly made from water pumped on the bark. After a few months, although the same amount of bark be used as at first, the stock shows more raw hide than it should. While the liquors may be in appearance all that they should be, they lack the amount of tannic acid necessary to feed the stock and of course grow worse as they are used over and over. Relying on extract to vamp up the liquors is a waste and the only remedy is to run the old sour liquors, which in many instances are no better than a drench, into the drains and keep the liquor yard sweet and clean.

MISTAKES IN TANNING AND HOW TO AVOID THEM.

Mistakes in the tannery result either from carelessness or lack of knowledge. There is not much hope for improvement where people are thoughtless and careless, but where the errors result from lack of knowledge great profit will result from an interchange of ideas and experience that have come from long service at practical work of making leather.

The careless use of arsenic in liming calfskins is a grave mistake.

The excess of arsenic makes dry and brittle leather. More than five pounds of arsenic to each 100 pounds of lime should not be used. If sulphide of sodium is used instead of arsenic, a better grain will result. In liming with sulphide of sodium, use for each pack thirty-five pounds of sodium to fifty pounds of lime.

BATES SHOULD BE TESTED.

Bating should be done with a good grade of chicken manure, and patent bates, unless they have been thoroughly tested and proved to be of value, should be let alone.

Many tanners fall into the delusion of running the stock after bating through sulphuric acid and salt, called a pickle. Stock treated by this process will not absorb fats satisfactorily when tanned. The stock will tan rapidly and will have a fine grain, but will finish badly.

The plumping of stock in cold water, after bating, is a bad practice and water-run is likely to result. The stock should be suspended in sour tan liquor for a couple of days to clear and plump before going into the tan liquor.

A great many errors are committed in the tan yard, especially where the combination tannage is used. Gambier is the principal ingredient in the combination tannage, alum and salt and the extracts being the modifiers. The stock should be tanned in gambier first and treated with the extracts last. By combining all the tanning agents in the same vat before the skins are tanned through, bad results will follow, especially in the finishing of the leather. A frequent error in the combination tannage is the excessive use of salt, which produces mushy leather.

FILTHY TAN VATS

are almost a crime. If the vats are clean the stock will need less washing and bleaching. If there is no dirt in the vats for the stock to absorb, there will be none to wash out of the leather. Strong liquors and rapid tanning are a prevalent mistake in almost every tannery. This is the cause of a large crop of troubles in the finishing of the leather. Another mistake consists of taking the stock out of the vats before it is properly tanned. Another popular error is strengthening the liquors while the stock is in the vats. This custom makes liquor stains and clouds, and burns are caused by the hot liquor coming in contact with the stock in the vats.

INDISCRIMINATE USE OF ALUM

in tan liquors is dangerous, because there is no way to properly gauge the amount of alum the stock takes up. Ultimately the liquors will become overcharged with alum, which will make a very faulty tannage. Alum is best employed in connection with salt as a bleach after

the stock is tanned. The stock should then be washed out thoroughly, and the tannic acid will be neutralized without danger of corroding the skin or salivating it. By this I mean that an excess of alum in the tan liquor makes the leather hard and likely to spew badly.

THE PRACTICE OF FAT-LIQUORING

the stock and then sending it to the dry loft without setting is objectionable. All stock when taken out of tan should be set out on the grain side and given a coat of oil. It should then be dried out before fat-liquoring. When stock is taken out of tan it needs live oils to nourish it to prevent cracking after the stock is dried.

BLEACHING FOR COLORS

after fat-liquoring is bad. The tanner defeats his own object, because he first nourishes the stock and then destroys the nourishment with a powerful bleach. Bleaching should be done before fat-liquoring, if possible, so as not to destroy the effect of the fat-liquor. Sulphuric acid should not be used as a bleach. It injures the skin and leaves it in a dry, parched state. A milder and less dangerous bleach can be accomplished with alum and salt. This will not injure it, but will really improve the stock. Many lots of stock have been ruined by using tartar emetic and antimony salts for bleaching. This bleach causes the leather to crack. Borax and lactic acid will do the work much more effectively and without any incidental injury to the stock. The attempt to bleach out liquor stains with acids is usually a waste of time. Such stains invariably reappear in the finished stock as prominent as ever.

IN SELECTING STOCK FOR COLORS,

there is a prevalent impression that cloudy and stained skins should be put into the dark shades. This is a serious mistake. The clouds will show more prominently, if anything, in dark shades than in light ones. Cloudy stock should be put into the shades that are nearest the color of the stains and clouds. It is all a matter of contrast, and for this reason cloudy stock will frequently shade up better in light colors. Stock for dark shades should be clear, and bleached as uniform as possible. For light shades bleaching is not absolutely necessary unless the stock has stains and clouds on it. A very bad rule of many dyers is to bleach all stock alike. This is an entirely wrong idea. Stock should only be bleached when it is necessary, and severe bleaching should only be resorted to in extreme cases.

SELECTION OF DYE STUFFS.

Perhaps the first false step in dyeing leather is in the selection of the dye stuffs. A good many dyers make the mistake of selecting dyes that will not stand oils. Dyers should test their aniline before using. If the tone of the shade changes it is evident that the dye does not agree with the oil, and another aniline will have to be secured that has the proper affinity for oils. Cheap dye stuffs are always a blunder, and no good results can be accomplished when they are used. A frequent mistake results from foolish economy in the use of aniline. When enough aniline is not used, dull and hungry-looking shades result. Dyers frequently blunder because of their hurry to get out the stock. By trying to save time and running the stock too short a time in the mill poor colors result, and the shades are what may be called fugitive. It is also a mistake to fat-liquor the stock before drying out. This will cause the stock to look pale and dull. Avoid the use of potash and copperas as a set. These drugs change the tone of the shade too much. Alum is the best set that can be used. The habit of leaving the stock on the horse too long before coloring and before setting out is very bad for the color.

After the skins are tacked they should remain on the frame until bone dry and then be taken off and stacked in a cool place for three or four days to absorb moisture. If this is done they will not have to be put into sawdust for the finishing process. Sawdust is liable to spot the skins and for that reason it is well to avoid its use. The temperature of the dry lofts should not be over 80 degrees, summer or winter.

SEVERE WASHING OF STOCK

after coloring is a mistake. A slight rinse in lukewarm water is all that is necessary. The setting of the skin will remove the undissolved sediment much better than severe washing, and the color will be deeper and stronger.

In finishing, it is easy to make the mistake of mixing the seasoning liquor too thick. This will cause a great deal of trouble and will smear the color badly. Beef blood and blood albumen should be avoided in making seasoning for colors. Egg albumen, flax and gum tragacanth are the best seasoning ingredients for color work.

Care should be taken not to stake the stock too much. By this mistake a good deal of loose and tripy grain is made.

Color stock should be perfectly dried out before leaving the finishing room. If not quite dry it is liable to sweat and mildew in shipment, especially in cold, damp weather.

ELASTICITY IN LEATHER.

In producing a leather which shall be elastic, prolonged liming and low drenching are necessary. The more the cementary substance is dissolved the greater movement is given to the fibers. In the natural state of the hide or skin this cementary substance or coriin fills up the space between the connective tissue fibers. In the green state of a hide or skin this substance is easily softened by the action of water, but when dried in the hot sun it is changed to a hard, horny substance which is almost insoluble. Sun-dried skins are very hard to work and many break up in the soaking and milling. Alkalies used in the water for soaking help wonderfully in softening this horny matter.

In depilating skins to be used in the manufacture of gloves, where softness, strength and elasticity are essentials, this cementary matter or coriin must be dissolved in such a manner as not to injure the fiber by undue swelling. The fibers must be left in such a condition that in the finished leather they can move in every direction without the tendency to spring back.

It has been found in practice that for glove leather red arsenic used in the limes gives better results than when sulphide of sodium is used: the red arsenic giving smoother and finer grain skins of more elasticity and strength. In the sulphided skins, although considerable hide substance is dissolved, the finished leather grows harder the longer it lies.

IN LIMING FOR SHOE STOCK,

a strong fiber is needed without undue stretch. On hides, calf and sheep the connective fibers are not as close as in goatskins, therefore less substance needs to be dissolved for the required give or stretch. Sulphide of sodium will loosen and split up the fiber bundles much more quickly than lime, and if used in the right proportion in connection with the lime and only for a certain length of time, will not dissolve as much hide substance as will the lime alone.

In using sulphide of sodium in the limes, care should be taken that the limes are kept clean and the liquor renewed often. The length of time that it is safe to use the liquors depends on the condition of the stock on going into the limes, whether it is full of filth or clean.

As has been said before, organic matter contained in the limes acts more rapidly on hide substance than lime itself, and this matter causes more spongy leather than does overstrong clean limes.

SULPHIDE OF SODIUM REQUIRES CARE IN USE.

Sulphide of sodium not only dissolves hide substance, but it dissolves the fibers themselves, and should never be used in an old or

warm lime. Tanners who understand thoroughly the action of sulphide of sodium are very careful on this point and are also careful that they do not use the sulphide too strong. In cold weather a lime containing sulphide of sodium may be used somewhat longer than in summer. In summer the safest plan is to run the liquor off from every pack as soon as depilitated and start up anew before putting in the next pack. It is also safer to use more lime in connection with the sulphide of sodium during the warm summer months than in winter.

COMBINATION TANNAGE FOR CALFSKINS.

For fancy colored calfskins the combination tannage is used extensively today. The leather takes on a deep, rich color, is pliable and elastic, and will resist water to a great extent. The tannage consists of salt, alum, sulphate of potash and gambier. The skins are best tanned by suspending them in liquor on frames by the hind shanks. This keeps the grain smooth, and plump, firm bellies result.

SKINS FREE FROM LIME.

For this tannage the skins must come from the beamhouse free from all lime, or leather with a reddish hue on the grain results. In gambier liquors there are no acids which will neutralize lime, as is the case in many other vegetable tanning liquors. Green stock which is free from lime takes on a buff color in gambier liquors that is even.

To be safe and sure that the stock is free from all lime before entering the gambier liquors, a tanner should run the skins in a paddle wheel after bating in a solution of boric acid and water. This will free the skins from all remaining lime and insure a nice even color on the tanned leather.

OILING.

After being tanned they are allowed to drain well and then are put in the drum to receive the oil. Cod oil emulsified by the use of borax is generally used. Leather readily absorbs cod oil either in the raw state or in emulsion. It is better to use the oil in the form of emulsion than in the raw state, since cod oil may be adulterated in many ways.

There is a very strong glue made from the codfish, and considerable of it is contained in cheap grades of cod oil. When this is given to the skins in the state in which it comes to the tanner, it collects on the grain. As a general thing, the skins are hung up to dry; after this oil has been milled into them the gluey substance remaining on the grain makes it absolutely impossible to get an even color. For this reason, unless cod oil is known to be absolutely pure, it had better be cut with an alkali to dissolve this glutinous matter.

After the stock is dried it is taken down and wet sufficiently for the staking machine. After staking it is ready for the shaving machine, and it is then re-tanned. If colored in the drum instead of the

paddle wheel, the skins should be drained well and thrown to both sides of the mill, so that the strong dye shall not strike the skins until ready to start the mill. After coloring they are put out on flesh and grain and again hung up to dry. When dry they are ready to be seasoned.

SEASONING.

The seasoning is made from milk and water to which the necessary amount of aniline is added to make the required face and shade. This is applied to the grain of the skins with a swab. After seasoning the skins are packed in a pile, grain to grain, for a few hours to "draw"; that is, to dampen uniformly. After being rolled on the grain and aired off they are given a light staking and the grain is rubbed on the felt wheels, which brings up a glossy face and helps soften the stock.

If put into black stock and finished into box, they are glazed on the glazing machine and the box figure imprinted by boarding with the hand board.

GOATSKINS IN THE BEAMHOUSE.

The working of goatskins through the beamhouse so that the grain will be soft and silky and the fiber so split up that it will take up and hold the tanning material is no easy task.

GOOD LIMING NECESSARY.

Goatskins being of a very tight texture and of coarse grain, need a good liming and drenching to bring them in proper condition to receive the liquor. Old limes on the start are necessary, since in these old limes the grain is kept from rising and becoming rough. The goatskins, having been taken from the limes and thrown in the pits containing soft water, should remain a number of hours to allow the depilatant to wash out, and also to soften the grain which has been roughened by the depilatants. This to a great extent lessens the danger of nicking and scratching the grain, which means much to the manufacturer when the skins are intended for fine leather. Moreover, allowing the skins to remain in the water for a sufficient length of time after coming from the limes enables the workman to work on them for some time before putting on gloves. The longer he can work without gloves the more he can accomplish in a given time, although the gloves are an absolute necessity after a time.

PUERING.

After the unhairing and fleshing, which in all large factories are now done by machinery, the skins are ready for the puering. The

excrement of the dog, pigeon or hen may be used for this purpose. That of the dog is perhaps the best, but it is expensive and difficult to obtain in sufficient quantity. If excrement of hen or pigeon is used it should be gathered while fresh and dried for future use.

The best way for preparing the excrement for puering is to put a sufficient quantity in a bag, place the bag in a barrel of water, run a steam pipe into the barrel, and raise the temperature to the boiling point. Cover the barrel to retain the heat and allow it to ripen. The use of bags keeps the gravel and other filth out of the bate, and the danger of scratching and discoloring the grain is lessened.

After the excrement is well steeped pour the liquid into the drench, throw the skins in and start the wheels. The next day the skins are taken out and are ready for stoning or slating, which is done either by hand or by machine. Slating works down the grain so that it is soft and silky, and removes all short hair.

THE BRAN DRENCH.

After slating many tanners put their skins in a bran drench, claiming that, although lactic acid is developed in the drench, there is something in the flour contained in the bran which is of great benefit to the skins. The bran drench is made by putting the required amount of bran in the pit, and running in sufficient water to make the mixture of a soup consistency. This is then thoroughly cooked by means of the steam pipe. After cooking, more cold water is added. There should be enough of this mixture to allow the skins to move about freely. As the drench sours, gases are formed and the skins rise to the top. It is necessary to stir them down once or twice or they will not be drenched evenly. Of course every tanner knows that lactic acid is developed in the bran drench. In hot weather the skins need to be carefully watched, for butyric fermentation is liable to take place, in which case the skin is destroyed in a short time. Butyric acid is a powerful solvent of gelatin.

WORKING OUT FOR TANNING.

After being taken from the drench, the skins are given a working out on the grain and then washed in warm water, after which they are ready for tanning.

Goatskins are naturally of a hard, tight texture of grain and will stand a lower drenching than most any other kind of stock. It is absolutely necessary that they should be well worked in the beamhouse.

Some have advocated the use of chemical bates to take the place of animal excrement, but the results are not satisfactory. The stock produced is wanting in softness. The removal of the lime on this

class of stock is not the only object aimed at in bating. If it were the usual process would be wasteful as well as disgusting.

CONTROLLING ACID IN TANNING SHEEPSKINS.

If in the tannage of sheepskin either by the chrome or the vegetable process too much acid is used, the skin is swollen beyond its normal capacity and its connecting fibers weakened. The skin may be brought back so as to appear natural, but the damage is done, and will show itself again when the skins have reached the finishing room. The grain having been once separated from the flesh is here again loosened by the softening process the skin is obliged to undergo in the finishing. When the skins are in this condition the agate or glass cannot slip over the grain without dragging wherever it strikes. This makes the grain look as though badly cracked, and on rubbing the skin in the opposite from that in which the pleated grain runs, it is found to be rough. To cover up the looseness of the grain, and to insure against the skin dragging over when glazed, finishers roll the skin on the grain while it is damp from the seasoning under the roller of a rolling machine.

RESULT OF IMPROPER FINISHING.

The leather injured in the tanning pulls away from tne flesh and a vacancy is felt in the leather between the flesh and the grain. On the other hand, in leather which has to be tanned, as it should be, but not finished properly, the grain will be found to adhere firmly to the rest of the skin, but when pulled over the last in the shoe factory the leather will pull out of shape. This latter defect is due to the leather not having been properly stretched when the skins were put out on the machine, or to its not having been properly tacked and dried on the boards. Owing to the fact that the sheepskin is so loose-fibered, a skin which has been perfectly tanned and colored may be upset in the drying.

DRYING BOARDS AN IMPORTANT ITEM.

In a sheepskin factory, where the output is large, the drying boards are an important item. In some factories one will see thousands of these boards six feet in length and four feet in width. As the drying of tanned sheepskin is usually done in cold lofts by the natural air, the manufacturer is obliged to keep an extra number of these boards on hand for use in wet weather. Without these boards he would frequently be obliged to stop his works while waiting for skins to dry.

TO PROPERLY STRETCH A SHEEPSKIN,

a row of nails is first driven in the edge of the butt; the workman then taking hold of the head with his pincers, pulls until all stretch has been taken out of the skin lengthwise; he then drives a nail in the head and proceeds to pull sideways of the skin with his pincers, driving a nail wherever it is needed, until all parts of the skin have been pulled out smoothly and nailed to the board.

PRESERVING SKINS.

Sulphuric acid and salt are used to preserve the skins after the beamhouse work has been accomplished, and through the action of the salt and acid the skins may be kept in this condition for a long time without spoiling.

It is necessary for a tanner who pulls the wool and limes the slat to process his skins in salt and vitriol before pressing under the hydraulic press, or the skins would split and slip down from under the plates.

PRESSING.

Before starting in to tan sheepskins, the surplus grease must be removed, and for this purpose the hydraulic press or wringer is used. The skins are spread out smoothly, two dozen each, between the plates. and when the press is full the pressure is applied.

Many tons of pressure are applied, and after the grease has stopped running from the skins the plates are taken out and the skins have the appearance of sheet iron. To get them in a soft condition again, the pressed cakes are placed in a drum and given a good milling in warm soft water. The warm water soon separates the skins, and in course of a half hour's drumming they are in good condition for tanning.

In tanning in pickled stock, enough salt should be carried in the liquor to keep the sulphuric acid in check. If sufficient salt is not carried, the skins will blow, and look like a piece of tripe.

STAKING SKINS.

There is much stock being cut every day that would have considerably less stretch to it if the staking was done as it should be. The less stretch to an upper the better shoe turned out. The idea of staking is to take out all possible stretch for measurement as well as softness. The feeling of softness in the unstretched skin is not what is wanted by the shoe manufacturer. An upper may feel soft, but it must be firm, and if it lacks the latter quality a good shoe can never be made.

The staking of skins today is mostly accomplished by machinery, but there are still many skins of a tawed tannage being staked over a knee stake by hand labor.

DAMPENING SKINS FOR KNEE STAKING.

In dampening skins for knee staking considerable judgment is needed to determine the amount of moisture necessary in the skins to obtain the best result; and, as no two men will wet the dry stock alike, and much depends on this for a uniform run of skins, the man who is known to have the best results from his dampening should be the one to wet down all skins for the stakers. If wet too much, the skins will not be softened in the staking, and on coming from the tacking boards they will be found to be hard and tinny. On the other hand, if not wet enough, they will stake harder, and will be too soft and mushy when taken from the boards.

DIFFERENCE IN INCREASE OF MEASUREMENT BY GOOD AND POOR STAKING.

There is a vast difference in the increase of measurement resulting from good staking and poor staking. Some men have the knack of taking out all the stretch there is in a skin without any apparent effort. while others will strain and bring down their whole weight without accomplishing anywhere near as good a result. Such a man as this will give the skins an excess of water when dampening them if he gets a chance. This will make them stake easier, but they will be hard and tinny when finished.

SKILLFUL BUFFING.

Sheepskins, after being staked, are tacked on the tacking-on boards, being stretched as tightly as possible, and left to dry. When thoroughly dry they are pulled off the boards and then buffed on the emery wheels. A skillful buffer will take hold of the hind shanks of a skin and start in to buff it by "sweeping"; that is, by bringing the skin on to the wheel with a swinging motion, holding the lower part with his body. In this manner the skin is kept moving. In the hands of such a man it is rarely the case that the skin is cut through. Such a man as this knows the importance of keeping his wheels in a good cutting condition, and will often be found renewing the emery on the spare wheels during the noon hour.

BUFFING WHEELS NEED LOOKING AFTER.

Buffing wheels require considerable power to run them, and it is important that they should be well looked after. As the buffing wheels consume a large amount of power and are a great strain on the belt, they

should be set on a solid foundation so as to lessen the rocking motion. They should not be too far away from the main shaft of the engine, and be so set that a fair length of belt may be used; for if they are run with a short belt the boxes are liable to be heated, as the belt has to be as tight as possible or it will slip. The belt being so tight pulls the shafting so that it bears hard against the boxes, and the babbitt in them is worn out in a very short time. This causes a great amount of friction, which requires much power to overcome it.

ROLLER SKINS.

Large quantities of sheep and calf skins are tanned annually for roller stock in hemlock and oak bark.

USES OF ROLLER LEATHER.

Roller leather is used in the machines for spinning cotton, each thread of cotton being drawn between two steel rollers, one covered with leather and the other polished smooth, and in proportion to the fineness of the cotton spun it is necessary that the texture and grain of the leather shall be correspondingly fine.

It is necessary that the grain of the leather shall be free from the short hairs and have a smooth and even surface on the flesh side, or the threads will be continually breaking.

It is also necessary that the tanned stock be free from all grease and salt, as the two edges of each piece of leather covering the roller are cemented together, forming a tube. This is slipped onto the roller and fits very tight, and is burned at each end to prevent slipping off. It is necessary that all possible stretch be taken from the skin in finishing or the covering will become baggy and slip from the roll.

BEST SHEEPSKINS FOR ROLLER LEATHER.

The kind of sheepskins best adapted for the purpose are those taken from coarse-wooled English sheep.

Where one does his own wool pulling, the skins are sorted directly after being pulled and low limed in clean lime liquor just sufficient to start the scurf and short hairs. They are then trimmed and fleshed either by hand over the beam or by the use of a fleshing machine. The stock is now drenched fairly low in the bran drench and well worked on the grain over the beam with a slate or stone to remove all short hairs, etc.

WELL-LIGHTED BEAMHOUSE NECESSARY.

For this class of work, a well-lighted beamhouse is necessary, for an imperfectly lighted beamhouse must of necessity turn out skins

which show cuts in the fleshing and are not free from short hairs in the grain. In some beamhouses so imperfect is the light that it is necessary for the workman to carefully scrutinize a skin from all points to make sure that the short hairs are all worked out from the grain.

The light in a beamhouse should come from windows directly in front of the beamsters, and the bottom of the windows should be no higher than the lowest point to which the beamsters reach.

PRESSING.

After being well worked out, the skins are made ready for pressing under the hydraulic press to remove the grease. As they are so slippery and soft they are given a slight tanning for a few hours in a sumac liquor instead of processing in salt and vitriol, which is usually the case after sheepskins have been drenched. The skins are placed in a tub of warm water and taken and spread out smoothly, a couple of dozen each, between the plates of the press. When the press is full the pressure is applied gently at first until the skins get set, then increased until all grease is removed. Care must be taken that too much pressure is not applied at first, or the fibers of the skin will be broken, making them unfit for this class of work.

TANNING.

The skins come from the press feeling like a piece of sheet iron and must be thoroughly softened before placing in the tanning liquors.

The cakes of skins are thrown in the drum and milled up in warm water until soft, when they are ready to be suspended in the liquors.

As these skins contain no salt and vitriol, as is the case in processed skins, no salt is necessary in the tanning liquors. The skins are suspended by the hind shanks on frames built for the purpose and lowered into the vats by a windlass. The liquor used for tanning is made either from oak or hemlock bark and the strength of the bark is extracted by leaching.

In tanning the skins, weight and plumpness is not a factor. The object is to have a thin, firm, pliable piece of leather with a light colored grain. Hemlock bark contains a large amount of coloring matter which would darken the liquors, and to prevent this the bark is rossed before being ground.

LEACHING.

In leaching the bark for this class of stock, steam is not used, for this darkens the liquor. The pipes which are used for conducting the liquor to and from the leaches should be of brass and not of iron,

as the tannic acid would eat out the iron pipe, making a strong iron black which would darken the liquors. The skins are started in weak liquors at first and shifted forward into stronger ones each day until tanned, when they are taken from the liquors and hung in the lofts to dry. When dry they are taken down, and if not wanted for immediate use they are piled down and left in the crust. The stock improves wonderfully by lying in piles for a length of time after being tanned.

SHAVING.

The tanned stock is sorted before being wet down for shaving, and then well struck out before shaving. The shaving is done over a glass surface, and great care is taken that the skin is shaved perfectly level all over.

The skins are now thoroughly put out and tacked on the tacking boards to dry. When dry they are softened in the perch by the use of a moon knife, and then seasoned, hung up to dry and glazed on the machine.

OFFAL FROM HIDES.

Since the introduction of beamhouse machinery into the tannery the trimming of the hide is accomplished before soaking.

TRIMMINGS SOLD IN SALT.

Previous to this all hides were trimmed after being limed and the offal sold to the glue manufacturer at so much per bushel. Today these trimmings are sold in the salt at so much per pound.

The piece which comes from the pate, which is split off the hide in the beamhouse when green, by the head splitting machine, is put through the different processes of manufacture and comes out as gelatin and used as a food.

HAIR IS UTILIZED.

The hair taken from the hides is utilized for various purposes. It is washed to free it from lime and then dried. It is mixed with wool and made into hats, blankets, etc. The white hair is sorted from the colored and brings a high price. Hair that comes from cattle tails, being longer and coarser, is used in manufacturing mattresses, hair-cloth, etc.

The horns are allowed to putrefy until the "slough" or "pith" can be knocked out. These sloughs are ground for bone meal and used by florists as a fertilizer.

HORNS AND THEIR USES.

The horns are used in the manufacture of combs, buttons and many other articles. The horns differ greatly in shape, color, texture and quality, and this variation depends largely on the breed, the feeding, the locality and the climate. It thus happens that the furrows on the horns of cattle that have been allowed to run at large, produced by irregular feeding and sickness, frequently cause considerable loss to manufacturers who purchase unselected stock. The rings on the horns indicate the age of the animal.

Young horn is more subject to wear than old, because it is not so tough, but it takes a better polish. Hungarian horns are thin and round, and grow sound and with a slight twist in their grain, while Polish horns are short, stumpy and full of seams, which reduce their value correspondingly. The same may be said of German horns, which are generally much cracked.

A very desirable class, on account of their sound and regular growth, are those of Brazilian cattle, which are used for all kinds of turned work, such as pipe mouthpieces, buttons, etc., while the points are worked up into umbrella and cane handles. The light colored and mottled points are considered more valuable than the black ones.

For heavier and stronger classes of work, the massive buffalo horns are employed, but these also show marked differences of breed and locality, those from Calcutta differing in shape and quality from the Siamese variety, which are more valuable. They are worked up into an infinite variety of articles which form quite an important branch of industry in some parts of Europe.

MAKING ROUGH LEATHER.

For a number of years there has been a scarcity of light colored bark-tanned rough leather, and for this reason many finishers of such goods have been obliged to tan their own hides.

Time was when the making of rough leather was quite a business, and many a country tannery was run exclusively on this class of goods.

GREEN HIDES SUSPENDED IN TAN LIQUORS.

The old-fashioned manner of handling the green stock in the first liquors by throwing the sides into the liquors loosely or by paddling in the England wheel produced a bird's-eye grain. This did not matter so much, since pebble grain was largely manufactured, but today smooth grain is called for, and all green sides are suspended in the tanning liquors.

The present demand for rough leather calls for stock suitable for japanning, card, russet and welting leathers.

For card leather it requires a grain free from all imperfections and cuts on the flesh.

The good old way of well working the hides in the beamhouse and tanning them through by suspending in the liquors before laying them away made a rough leather which would bring a high market price today.

SOAKING.

In soaking the hides they were suspended on sticks and hung in the water pit. When the soak was full it was run up with cold clean water and after a few hours the dirty water was run away and the soak refilled. This was kept up at intervals for three days, when the hides were properly soaked. By this method the hides were more evenly soaked, all danger of scratching the grain with a hand hook dispensed with, and considerable labor in handling was saved.

SPLITTING.

The hides being soaked were removed from the water and split down the backbone into sides. To insure a straight line the whole hide was thrown across a heavy plank with a groove running the whole length. This groove guided the knife in the hands of the workmen and the hide was cut in a straight line from head to butt. The sides were next fleshed by hand over the beam or by machine. In fleshing all grease and superfluous flesh must be removed without injuring the film that covers the fiber.

LIMING.

In liming the hides a mixture of sulphide of sodium with the lime gives a fine grain and hastens the liming process. To save labor and prevent all danger of scratches, the sides are toggled together and reeled from lime to lime instead of hauling out with a hand hook and setting back. The limes should be well plunged up with a plunger before reeling over.

After the sides are well limed they are reeled into water heated to 95 degrees Fahrenheit and allowed to remain over night before starting to unhair.

WASHING.

After unhairing and working out, the sides are washed in warm water and placed in a drench of lactic acid to remove the lime. From the lactic acid bath they are paddled for one-half hour in a solution of boracic acid and water. This removes all traces of lime and a light colored, even grain is assured.

The sides are now suspended in a sour liquor of about four degrees strength to remain over night, when they are shifted over into a stronger liquor. The sides are brought forward into stronger liquors

every day until well struck through, when they are ready for the first lay-away.

LAY-AWAYS.

For the first lay-away, an old sour liquor of twelve to fourteen degrees is used. The stock is allowed to remain in this layer for two weeks, when the stock is started out and laid away in a sweet liquor for three weeks. The stock is again started out, given a stronger liquor and laid away until well filled with bark.

The tanned stock is now taken from the vat and rinsed in a vat of water heated to 110 degrees and allowed to drain. When drained the sides are well oiled and then hung up in a dark room to dry. When dry the sides are rolled up for the market.

TANNING AND DRESSING DEERSKINS.

In tanning and dressing buck or deerskins, there are two methods sometimes employed.

OLD-FASHIONED METHOD.

The first is the old-fashioned oil-dressed method, in which the skins are proceeded with in the same manner as to prepare stock for limes. After the skins are well softened in the soaks and thoroughly fleshed, make a preparation of lime and water about the consistency of white-wash, and apply to the flesh side of the skins, and fold the skin up hair side up. The skins are placed in small piles and in a day or two the hair is ready to be removed. The skins are now unhaired and placed in the limes to further plump them and to raise the grain.

After the skins are grained and thoroughly washed and worked on the beam, oil them well on both sides, flesh and grain, and roll up for a few days, then hang up to dry. When thoroughly dry wash them in strong soapsuds. Do not rinse out the soapsuds. The washing must be thoroughly done to remove all oil. When partly dried they are worked and stretched to make them soft.

TANNING ACCOMPLISHED IN THE STOCKS.

Today the tanning or tawing of buckskins is accomplished in the stocks. After the beamhouse work is completed, the raw stock is hung up to dry, and after drying it is soaked back and placed in the beaters to receive the oil. The oil is fed gradually to the skins, and after they commence to heat the skins are taken from the stocks and spread on the floor to cool. After being cooled the skins are returned to the stocks, more oil is added and the process repeated until the skins are tanned. After tanning, the skins are pressed under a press

to remove all heavy oil possible and then washed in soda ash to remove the remaining oil.

ANOTHER METHOD.

The other method of tanning deerskins is as follows: The skins are prepared in the limes and bate same as ordinary leather, but must be limed higher than for ordinary leather. Care must be taken that they are not drenched in excrement too low. After being well washed from all filth, the skins are placed in a sweet sumac liquor until struck through, then put out on flesh and grain and oiled lightly on both sides. In oiling, care must be taken not to oil too heavy, especially on flesh side, as, the skins being porous, the oil is quickly absorbed. After oiling, hang up to dry, and, when dry, buff the grain away with a whitening slicker; then stretch the skins and run in dry drum wheel until perfectly soft, and then finish on emery and brush wheel. The color may be varied from canary white to a yellowish color by adding little alum, or brown by the addition of gambier.

THE ART OF MAKING PLIABLE LEATHER.

In many cases tanners do not observe the difference between hides and hides, but work them all alike, says a veteran tanner. In some tanneries fresh hides are received; hides from two weeks' salting; also old salted hides. There is a difference between them, and careful tanners should remember this. Fresh hides need only to soak a few hours, and this will free them from the blood and dirt, so they can be put up into the limes. Such hides plump quickly, unhair easily, and make soft leather, but not of fine grain.

FRESH SALTED HIDES BEST.

Fresh salted hides, which have not been long in the salt, seem to yield the best results for fine, soft leather. Such hides do not need long soaking; in winter, about 48 hours is enough. In summer, when river water is employed for soaking, the time limit should be 24 hours. For instance, soak on Monday afternoon in fresh water, change the water next morning, and on Tuesday afternoon haul out, let drain and put into the limes. Hides should be fleshed before liming, and all fat removed. In warm weather hides are liable to rot from lack of prompt and effective removal of flesh and fat.

THOROUGH SOAKING NECESSARY.

In working hides that have lain long in salt, a thorough soaking is necessary with frequent changes of fresh water. If it should happen, as it sometimes does, that such old hides have been doctored, it

is well to give them a five minutes' milling in fresh water, so as to effectually wash them.

In my experience, the best way to free hides from salt and dirt is to soak in running water. In former years tanneries were often built alongside rivers and creeks. The hides were suspended in the running water with sticks, and held in place by chains or ropes. Nowadays tanners are less dependent on rivers, as the soaking can be done effectively in the modern beamhouse.

Such hides are less easy to soak than green hides. Dry salted soften up quickly, but it sometimes is difficult to put flint hides to their natural conditions.

NO FRESH WATER USED ON FLINT HIDES.

First of all, no fresh water should be used on flint hides. In tanneries where salted hides are soaked, it is beneficial to hold the old water and soak the flint hides in it. It is better if about four pounds of sulphide of sodium is given to about 600 gallons of water for soaking. Sodium has the effect of preserving the hides.

BORAX GOOD FOR SOFTENING AND PRESERVING.

Borax is also good softening material with preservative qualities. Dry hides may be left in soak two days first, and then worked either in the beamhouse or broken in a hide mill. In winter water should be used about 65 degrees to 70 degrees. The hides should then be put back in the soaks over night, or piled and covered up for the same time. They are then put into warm water, not cold, and afterwards sorted out, and those which have hard spots should be worked again. Some of these suggestions may be useful to my brother tanners.

SULPHIDE OF SODIUM IN TANNING.

Sulphide of sodium, when used in the lime, is proving a good thing on certain hides and skins tanned by the chrome process for upper leather, also for bark tannage on sole leather; but when used improperly, the finished leather is wanting in softness and elasticity.

Some few years ago a morocco manufacturer hired a man who had come into his factory bringing a few sample skins and telling how cheaply they could be turned out from the beamhouse, tanhouse and finishing room. The samples shown were soft, pliable and in every respect all that one could ask for. He was given five dozen skins in the hair to beam and tan, and when they were tanned the manufacturer was to finish them himself.

MOROCCO MANUFACTURER'S EXPERIMENT.

The five dozen skins were soaked and softened, and when ready for the unhairing process were placed in a solution of sulphide of sodium and water. In three days the hair was reduced to a pulp. The skins were then placed in the pin wheel, and, to free the grain from the hair and scurf, were washed in warm water. On coming from the mill they were found to be free and clear from all hair, looked very well, and the flesh stripped off easily when the skins were fleshed over the beam. They were then put into a bran drench for about twenty-four hours, washed again in the pin wheel, and tanned in the combination tannage. When dried out from the tan, the skins looked well.

The manufacturer was so well pleased with the way things were working that he gave orders to fill the soaks with hair skins and rush them along. The tanned skins on reaching the stakes did not give or stretch in the staking, as they should have, and, on being glazed, they were quite hard. The longer they lay after being finished the harder they became, thus proving something else was necessary besides simply removing the hair.

A VALUABLE DEPILATORY AGENT.

In former times the only depilatory known for all grades of leather from the heavy sole to the finest kid was lime. Qualities are now called for in leather which lime alone cannot give. Something must be used in connection with the lime which will prevent the grain of the skin from being roughened, and also prevent the skin from plumping too much. Red arsenic used in connection with the lime has been found to meet the requirements for depilitating hides or skins for upper leather, where considerable give or elasticity is essential.

HIDES AND SKINS FOR GLOVE LEATHER.

In depilitating skins to be used in the manufacture of gloves, sulphide of sodium with lime does not dissolve the cementary matter of the tissue so that the fibers can move over each other without adherence. Good glove leather should be capable of stretching in every direction without the tendency to spring back.

HIDES FOR CHROME TANNING.

In depilitating hides or skins to be tanned by the chrome process, there being very little plumpness to this tannage, it is necessary to hold up the skins through the beamhouse process. In this, sulphide of sodium in the limes is proving to be the chemical to use. It brings back a hide or skin nearer to its natural state, even when it has become

whitened with age by remaining a long time in storage. Sulphide of sodium has the properties of making the grain and the hide itself very tough and of close fiber. It has been used successfully on hides where a tough grain was essential. Many tanners in using sulphide of sodium are having trouble because of the short, fine coat of hair not giving readily. The reason for this is that they are not using enough lime in connection with the sulphide.

By using the sulphide in the limes, caustic soda is liberated, which increases the unhairing and plumping effect. Sulphide of sodium will loosen and split up the fiber bundles much more quickly than lime, and, if used in the right proportions and only for a certain length of time, will not dissolve as much hide substance as will the lime alone.

USED IN TANNING DRY HIDES.

As the sulphide has the properties of splitting up the fiber bundles so much faster than lime, it is especially valuable for dry hides.

In the drying of hides the fibers have become cemented together by the change they have undergone, and because of this they do not give as readily as in green salted stock. If the loosening of these fibers be left to lime alone it results in a large loss of hide substance, and for this reason dry hides for sole leather were formerly generally sweated; but since tanners are learning more of the use of sulphide of sodium many of them are now advocating its use.

TO MAKE COAT LEATHER.

For coat leather, a large spready skin is needed, so that the coat cutter can get out his patterns without piecing the stock. The coats are made from calfskins, sheepskins, dogskins and horsehides. They are lined with various materials—sheepskins tanned with the wool on, corduroy, flannel, etc. Sheepskins are no doubt used for the purpose of making coats more than any other class of stock, as they are the cheapest article in the leather line known to the trade.

It takes twenty-four feet of leather to make the average sized coat, and the cost of the finished article is brought up according to the value of the lining used. The corduroy-lined coat is made reversible, so that either the leather or the corduroy may be worn outside, at the wearer's pleasure.

TANNING SHEEPSKINS.

In tanning sheepskins for coat leather, the skins are first pressed under a hydraulic press to remove the grease, and then milled back to their natural condition in the drum. The next step is to remove the process, which consists of vitriol and salt. To remove this, or neutral-

ize it, whiting in solution is thrown into the drum and the skins drummed until all traces of the acid have disappeared. Care should be taken that the whiting is well washed out by warm water before starting in to tan, or the skins will be tender, and when the leather is made up into coats the stitches will tear out easily.

After the skins are well washed, they should be drained and tanned in the drum with a combination tannage made from salt, sulphate of alumina, sulphate of soda (Glauber salts), sulphide of potash and gambier. After milling the skins in this tannage for an hour, they should be horsed up and left for a day or two, and then put back in the mill and fat-liquored. For a fat-liquor, cod oil and soft soap are boiled together and after being well emulsified a little French degras is stirred in the solution. The oxidization of the fat-liquor in the skin helps largely to tan it and also to make it resist water.

COLORING.

After having been fat-liquored, the skins are again horsed up smoothly and left to draw. They are next colored over an oval table by brushing. The flesh side of the skin should be kept clean from blacking, as a clean yellow flesh side is desired. The skin is first struck out smoothly with a slicker and a mordant made from urine and bichromate of potash is well brushed into the grain of the skin. The mordant opens the grain and also prevents the coloring material from penetrating to the flesh side. After brushing with the mordant the logwood liquor is applied, the skin again slicked off and another brushing of logwood is applied to the grain. Two brushings of logwood are generally necessary to bring up a good bottom which is set by an application of copperas water. After the copperas water has been brushed into the grain the skin is well rinsed off with water to remove all surplus coloring material. All danger of smutting is thus overcome.

DRYING.

The skins are now hung up to be dried. After being dried they are dampened by dipping them in water or by packing away in damp sawdust. After the "sammying" they are knee-staked. Care must be taken that they are sammied just right. If too wet when the skins are staked, they will be hard when they come off the "tacking-on" boards; if too dry, they will "pipe" on the grain and be mushy. After being staked many tanners arm-crutch the skins in the perch.

In making this perch two upright sticks of timber are stood opposite each other, about seven feet apart, and running from the floor to the ceiling. About three feet from the floor a cross-piece of timber is fastened to both upright pieces. After the skins are put on this piece they are kept from slipping by another cross-piece of the same length,

which is placed on top of them and fastened at both ends by wooden pins. This acts as a vise and holds the skins while they are being crutched.

CRUTCHING.

In crutching, the skins are placed in the perch lengthwise in a slanting position, so that the top cross-piece will strike part of the neck and side of the butt; and since but one-half of the skins to be crutched are on the working side of the perch, it is necessary to reverse them to complete the crutching of the whole skin. This crutching is done with a round-bladed knife that fits in a handle, the top of which moves on a pivot and is made to fit a man's armpit. After having been crutched, the skins are nailed on the tacking-on boards to stretch them and allowed to remain until thoroughly dry. If the skins are taken off the boards when a little damp, they will shrink, and then there will be a loss in measurement. After coming from the tacking-on boards, the skins are buffed on the emery wheels to remove the loose flesh. They are now ready to be rolled on the grain under the rolling machine, which lays down the coarse grain and brings up a dull, smooth face. Sometimes the skins are ironed instead of rolled, which lays down the grain and also brings up a brighter face than does the rolling machine.

STUFFING.

The next step is to stuff the skins on the grain. This helps to make them waterproof. This stuffing, or composing, as it is sometimes called, is a mixture of beeswax, paraffin wax and neatsfoot oil. The quantity of this to be used on the skins depends on how heavily the skins were fat-liquored when tanned.

When tanning the skins in the drum, they should be fed gradually, a bucketful of liquor being thrown into the wheel every ten minutes until the required amount of tanning material is absorbed.

When fat-liquoring, a good run of cod oil should be used, or the leather will have a fishy smell, which is very objectionable, and which condemns the leather for coat purposes.

TANNERY SUGGESTIONS.

SETTING BELT KNIFE FOR SPLITTING RAW HIDE.

In setting a belt knife for splitting raw hide, always set the front plate about one-eighth to one-quarter inch above the center of the feed roll, and there will be no trouble with the grain winding around the feed roll.

PREPARING HIDES FOR GREEN SPLITTING.

When preparing hides for green splitting, they should be washed after unhairing, then worked for fine hair; then horse up to drain

over night. Care must be taken not to allow the ends to dry. When lime dries in a hide the grain will never tan and finish right.

MISTAKES IN MAKING CHROME LEATHER.

A mistake that often happens to bark tanners who have started to make chrome leather is that they use a chemical bate and do not use enough care in washing the hides as they come from the bate, carrying more or less of the bating liquor into the sulphuric acid and salt pickle. When this occurs, there is bound to be trouble with a loose and tender grain. Tanners who contemplate making chrome leather must not get the false idea that they can handle the hides just the same for crome as for bark. It will take quite a little experience to get the best results. One of the first things they should learn is a system of beaming the hides so as to remove all the hair without too much hard work, and at the same time leave the hides in a firm condition. Hides that come from the beam in a loose, flabby condition will make a poor piece of finished chrome shoe leather.

SOFT-FEELING GLOVE LEATHER FROM COWHIDE SPLIT.

Tanners who wish to get a nice, soft, full feeling piece of glove leather from a cowhide split, tanned with double bath chrome, will get that result if they will use a short liquor—that is, just enough water with the bichromate of potash so that when the hides come from the mill they will not drip. Then when they are given the second bath of hypo the chromed hides should be placed into the hypo liquor, the mill started and the muriatic acid added to the hides just as soon as possible.

To get the same result with a single bath liquor, use a heavy pickle, two pounds of sulphuric acid, sixteen pounds salt, and fifteen gallons of water to each one hundred pounds of hides. Then give them the maximum amount of tan liquor. After the hides are fully tanned, add one and one-half pounds of bicarbonate of soda, dissolved in cold water to the mill of hides, run half an hour, then horse up twenty-four hours and wash.

MANUFACTURE OF PARCHMENT AND VELLUM.

Parchment is made by some dozen firms in England. The following is the process:

Take the sheep pelts after they have left the wool pullers' yard. First, these are put in lime pits for about three weeks, drawn from the pit in the morning and set at night. By this method the pelts get up fine and plump. They are then taken to the fleshing beam and fleshed ready for the splitter. After the limed pelts have passed through the

splitting machine, the linings—that is, the natural part of the skin nearest to the sheep's back—are thrown in a heap. The grains, of course, go for skivers. The linings are then sorted; clearest skins free from stains are selected for parchment, and inferior ones go for chamois leather.

FLESHING AND SPLITTING.

Having selected parchment linings, these go over the fleshing beam again and through the splitting machine again for a portion of the fat to be cut off. They are then ready for the parchment maker. They are then tied in about one dozen in wooden frames at once. Size of frame, about 34 inches wide and 39 inches long, with pegs in frame and cords to tie, same as in alum tanning, a sheepskin rug in a frame, with cork to use as pippins with which to tie in the skin.

After they are in the frames, dozen at a time, they are taken below and fleshed off. Boiling water is used in this process and all filth and grease is worked out of the skin. A round knife, box handled, is used for this process (made by Spear & Jackson, Sheffield). It is something like a cheese cutter, but on a larger scale.

DRYING AND SHAVING.

After all filth and grease is worked out and skins are clear and tightened up by use of the pegs, they are taken during fine weather to the open yard. The sun will remove all stains and fog spots from the skins. Then they are taken to heated stoves for drying off. When the skins are perfectly dry they are then rough parchment and ready for shaving, the flesh side of the skin being smooth and level. This is the most skillful part of parchment making. For shaving use a very keen edge. A straight edge would burst the skin, so a wire edge is put on the knife and the rough side is cut right down and the skin made smooth.

WHITENING.

The skins are then whitened by a liquid whitening. This will draw out any grease left in the skin. They are then dried again and from here taken to the trestles and are scalded by lukewarm water and washed off. They are then taken to the drying sheds. Pure open-air drying for parchment is used, as this enables the skins to get a whiter color.

When they are perfectly dry, skins are looked over and cut out of frames, rolled up and taken to warehouse for squaring boards. The government offices use a large quantity of parchment. Wills and deeds, soldiers' and sailors' discharges, and humane society certificates for life saving, diplomas or honor, etc., are made out on parchment.

PARCHMENT FOR BOOKBINDING.

A good many skins are dyed different colors in the frames and used for bookbinding, much parchment being used this way.

Parchment orders come in different sizes: 11 by 18, 16 by 21, 23 by 27, 24 by 28, 25 by 28, 22 by 29, 27 by 29, 28 by 29 and 30 by 36 inches. The size 30 by 36 is cut from special skins, as it is difficult to get. Skins are placed on the squaring board and a pattern used and parchment cut up according to orders. There are thre grades of parchment shipped—best parchment, seconds and forrill. Parchment scroll left in the frames after skin is cut out is sold for glue pieces. Country air is better for parchment making.

Vellum is made out of calfskins, same kind of frame being used, but no hot water. A great deal of shaving is needed on calf for vellum making.

Vellum is used for certificates and drum heads, but they do not make a great deal of vellum in Great Britain at the present time.

MANUFACTURE OF WELT LEATHER.

Owing to the increased demand for welt shoes, the demand for welt leather is increasing. Many shoulders of union sole leathers are used for welting, and to get the leather into condition for making the welts the shoulders are put through a special process which draws out part of the tannage and makes the leather soft and pliable.

SOAKING.

In tanning hides for welt leather, the hides are soaked for about 24 hours in clean cold water and then hauled out, split down the backbone and trimmed. They are then fleshed on the machine and returned to the soaks to complete the soaking. After being soaked sufficiently, the sides are hauled up, toggled—that is, tied together at neck and butt, and reeled into the limes. Care must be taken that the sides go into the first lime in a smooth condition, or they will be wrinkled and bother all through the reeling process.

LIMING.

Many tanners start their hides in strictly lime liquor, and then on the third day put them into a lime liquor containing sulphide of sodium. About six or seven days' liming is necessary in order that there may be some give to the leather. It has been proven in practice that it is much better to use the sulphide of sodium after the hides have been in the limes three days than to use it in the first limes. Sulphide of sodium attacks the hair first. Lime has the opposite effect, attacking the hide fiber before it affects the hair sheaths.

UNHAIRING.

After the hides have been well limed and are ready for the unhairing, they should be removed from the limes and placed in warm water at a temperature of 90 degrees F. The warm water softens the grain and the hair gives readily under the unhairing machine. After unhairing on the machine, the sides should be given a good working on the grain, over the beam by hand, to remove the scud and fine hairs. They should next be well washed in the paddle wheel and then fleshed on the fleshing machine.

DRENCHING.

After being fleshed the hides are ready for the drenching in the bate wheel. For a bate the excrement of the hen is generally used. The excrement should be soaked a day or two ahead, and before adding the liquor to the drench it should be strained through burlap so that no gravel or grit may go into the liquor.

Many a pack of hides has been badly scratched on the grain by allowing the sharp little stones contained in the excrement to go into the bate wheel. The sweep in the paddle wheel is built oval, and, as the paddle wheel turns, the hides rub against the sides of the pit, and it can readily be seen that if any sharp grit gets in the liquor the grain cannot escape being scratched.

TANNING.

After the hides are drenched they should be paddled in a weak bath of lactic acid and then well washed in water. They are then ready for the tanning, and to insure a smooth grain the sides are tacked on sticks and suspended in the bark liquor. Only a weak sour liquor of but few degrees strength should be used at first to plump the hide and set the grain. To have the liquor sufficiently sour, many tanners use a rye flour. The mixture is made up in a barrel and after it has well soured a few pailfuls are added to the bark liquor. This not only has a tendency to plump the hide but it fills the bellies and flanks as well.

BORAX SAFE TO USE.

Borax is quite a factor in assuring smooth grain, and a grain that will not crack, which is quite essential in manufacturing welt leather. Borax is a safe alkali to use. It does not burn and roughen like many other alkalies, and because of its softening nature it makes a bark liquor mellow, keeps the grain of the hide open and hastens the tanning process. The borax should be used in the liquors after the hides are well plumped and only until the leather is one-half to two-thirds tanned. Then the following liquors should be free from borax.

Since welt leather receives but little oil, the cracking of the grain

cannot be remedied in the finishing and care must be taken in the early stages of tanning.

After the leather is tanned it is hardened, skived and made ready for the splitting on the belt knife.

ELECTRICITY FOR FINISHING LEATHER.

Electricity for ironing skins is proving itself to be the only absolute safeguard from burning the leather. By its use a steady, uniform heat is applied to the iron at all times, which insures the grain of every skin laid down properly. Even when the iron is in the hands of a green man there is no guessing for him to do.

OLD METHODS WASTEFUL.

In ironing skins by the old method of heating the irons, namely, by coal, gas, or oil stoves considerable time is wasted in heating the irons. As a general thing they are either too hot or too cold. It not infrequently happens that workmen who have a lot of coarse grained skins to iron take chances in the ironing, well knowing that the hotter the iron the easier it will slip along and the better the grain will lie down. Considerable leather is burnt in this manner. It is not only the grain of the skin that is injured, but the whole substance through to the flesh. The skins, of course, are burnt easily because of the fact that they are greasy.

It is always the best part of the skin which is injured, since the workman places only one-half of the skin on the table at once, and commences to iron down the back and then swings towards the flanks. Although this burning of the skin leaves it tender, it is frequently not noticed until it tears out in the making of the shoe unless a buyer has had trouble with skins of this sort and is looking out for them. In such a case, the extra glassy smooth surface shows the leather to have been burnt.

ELECTRICAL SYSTEM ECONOMICAL AND SAFE.

Today most every factory is lighted by electricity and it is a small matter to install an electrical system of ironing the leather. It will pay for itself in a very short time in the saving of labor and time, saying nothing about the saving in the extra cost in insurance for gas or oil stoves and the loss in damaged leather by using the old method.

One little item we must mention is that the iron heated by electricity is always free from smut and therefore cannot stick on the face of the leather.

BRIGHT BLACKING VARNISH FOR SHOE LEATHER.

Dissolve together in a bottle, tightly corked, one ounce of caoutchouc and one ounce of carbon bisulphide and let stand for a few days. Now dissolve three ounces orange shellac, half ounce gum sandrac, one and one-half ounces gum mastic and five ounces pure Venetian turpentine in two quarts of alcohol. Add the turpentine after the other gums are dissolved. When all these materials are well mixed, add the caoutchouc and carbon bisulphide. Put the vessel containing the complete mixture in another vessel of hot water and heat to about 120 degrees. Now add one ounce of black aniline. Keep the whole in the hot water for about one hour at 120 degrees. Then put in jar, cork tight and let stand for two weeks at least before using. It improves with age.

When using, dissolve two ounces of gelatine (isinglass) in one quart water and boil until dissolved. To this add one ounce indigo blue and then add two quarts cold water. Let cool and set so as to see that the mixture is not too thick, as the heat of a finishing shop or summer weather has much to do with the amount of water that gelatine will absorb. The mixture should be like thin jelly.

To mix, heat the gelatine a little and strain through cheesecloth. Then mix equal parts alcohol, gum and gelatine. Stir until it sets or gets thick. While stirring add to each gallon of mixture one and one-half ounces glycerine. When it is well set it is ready to be applied to leather.

This varnish comes very handily to parties running a small shop who wish to produce bright black polish on grain shoe leather of any tannage and yet who lacks the necessary machinery for doing the work same as large places. Two thin coats should be spread on the grain evenly with a sponge and well rubbed in with a fine sponge or a soft hair brush in a warm room. Let the first coat get well dried in before applying the second. After the last coat is absorbed, glaze the stock lightly by hand so as to produce the soft feeling the stock had before the varnish was applied. If these instructions are carefully carried out the result will surprise and please all who try them.

HORSE HIDE LEATHER.

It is scarcely fifty years since horse hides began to be tanned into leather, and while their tanning was not absolutely unknown, it never was employed in any way for shoemaking or for any of the articles related to that trade. The natural sponginess of skin when made into cordovan, even when well stuffed with grease, made it resemble sheepskin more than calf and other analogous leathers used in shoemaking.

PATENT COLT A MOST USEFUL LEATHER.

In recent years, however, there has been a notable change, so that at the present time patent colt is considered one of the most useful leathers in the trade. One portion of the hide is quite suitable for uppers, while other parts of the skin, on account of its firmness, offer a sufficiently flexible material for boot legs, for which it is preferable to kip because it is better finished. The softer portions of the skin can be employed for shoe tops, so it will be seen that the whole skin can be used profitably. This result has been due entirely to a long study of the peculiarities of the skin and the treatment necessary to overcome its natural deficiencies and utilize its good qualities.

HORSEHIDE POSSESSES DISTINCT CHARACTERISTICS.

When and how it was discovered that horsehide possessed characteristics entirely distinct from other skins is of no great importance; but the fact that such a discovery was made and that the leather produced from it possesses qualities that place it beside calfskins is important, because that fact suffices to give it a place among the materials that can be employed in shoemaking.

Through some unknown law of nature the horse is provided with a skin absolutely distinct, as to the arrangement of its fibers, from that of other animals. If we draw a line along the center of a horsehide we find, on reaching the point where the mane commenced, that it has there three distinct layers. The outer layer or grain is exactly the same as that on other portions of the body, and the inner one is the same as the flesh side of the skins of other animals; but between these is found another layer quite different. This intermediate layer is wanting in fibers, but is dense and flexible, and when well tanned resembles calfskin in texture, has a soft surface, takes and holds color well and possesses other qualities which render its use possible as a substitute for calf.

THE PORTION OF THE HORSEHIDE SUITABLE FOR USE

in this way measures from eighteen to twenty inches long by sixteen inches in width. The tanning and finishing of this part of the skin requires skill, for unless it is well tanned it cannot be well finished. On the other hand, the part of the skin from the croup, if not well handled, is entirely useless, and this is one reason for the little value that was formerly set upon this class of leather.

The discovery of the chrome tannage and the better understanding of the action of lime on hide substance has led up to a fine piece of leather being made from horsehides.

Today thousands of horsehides are imported annually from Russia, tanned by the chrome process and finished into patent leather.

WASTE PRODUCTS IN TANNERIES.

One of the most valuable waste products in the carrying of leather are the whitenings. These whitenings are shavings cut from the flesh side of leather after it has been stuffed and dried, and for years were thrown away or used for fuel in heating the currying shop for the curriers, who burned them with dry tan in a large, boiler-shaped stove. Most curriers little knew how valuable this by-product would be in the near future as a stuffing which would give greater results in their leather than any they had been using. The whitenings are now bought by grease manufacturers, who recover the grease in various ways, some by the use of naphtha and some by boiling them a number of hours in a tank and pressing out the residue, which comes from the press in cakes and is used for fuel. The same oxidation takes place here as in making the true degras, by the different oils in the stuffing combining with the air and the leather. The oxidation must be due to this combination of oils that are subject to the air alone. The water being allowed to evaporate would show the same results as the recovered sod oil, which has been pressed from oil tanned skins.

The rendering of whitenings has become quite a business in itself. The residue more than furnishes the required fuel, and the whitenings can be paid for in grease returnable to the currier. This grease is mixed with paraffin wax, degras and other oils for stuffing in the currying shop. The percentage of this hard grease to be used depends upon the class of stock into which the leather is to be finished.

IN THE MOROCCO SHOP

the shavings from goatskins which have been hand shaved are utilized in the manufacture of stiffening stock, and are made into what is called "pasted stock." These shavings are bought by the shoe stock manufacturers at so much per barrel and are milled up in the pinwheel, after which a flour paste is thrown into the wheel and thoroughly milled into the shavings. They are then made into sheets about a foot square, by taking a good sized piece of leather skiving, called a cover, for the starting point. The shavings are opened out, and spread evenly over the surface of the cover until the required thickness has been reached. A top cover is placed on them to prevent slipping and to give the appearance of solid leather. The sheets are then spread out to dry. After drying they are rolled between two rolls to press the pieces of the skins together. They are either sold to the shoe manufacturer in sheets or dinked into heels.

SKIVINGS ALSO USED.

The part taken off by the splitting machine in the leveling of splits called a skiffing, is used in the paste shop for making counters, inner-

soles, etc. The trimmings that come from the splits when in the rough state are also used for this purpose. The small pieces that tear off from the skins, while staking, and all skins that have been damaged in the works, are bought by men who make a specialty of this kind of stock. They take these pieces and damaged skins, sort them into different grades, season and glaze them, and sell them to manufacturers of infants' shoes. Some of these manufacturers are said to buy nothing for uppers but these pieces.

HAIR TAKEN FROM THE HIDES

in the beam house is also utilized. It is well washed to free it from lime and then dried. It is mixed with wool and made into blankets, hats, etc. The white hair is sorted from the colored and brings the highest price. Hair that comes from cattle tails, being longer and coarser, is used in manufacturing mattresses, hair cloth, mats, etc.

HIDE TRIMMINGS.

The trimmings from hides are used in making glue, and the piece that comes from the pate, which is split off the hide in the beam house when green, by the head splitting machine, is put through the different processes of manufacture and comes out as gelatine.

There has been a time when the hide trimmings would pay the beam house help and the rent of the tannery.

SPENT TAN BARK.

The tanner in those days had also quite an income from the sale of dry tan, as almost everyone in the tanner's section used dry tan for fuel, both for heating and cooking purposes. Every tanner dried and stored away in large tan sheds enough dry tan to operate his plant during the winter months; but this drying of tan was done away with when the tan press came into use. The press forces the liquor from the wet tan and leaves is almost dry. Many a tannery furnace is fed with this fuel and very little coal is burned from one year's end to another.

SOLE LEATHER TRIMMINGS.

The waste pieces in cutting soles from sole leather are manufactured into leather board for heels, etc.; the small pieces are pulled apart by machinery and pressed into sheets. Sole leather trimmings have the whole fiber of hide and it is possible to manufacture a leather board which is almost 100 per cent leather.

BARK TANNED TIPPING.

To make the best bark-tanned leather for patent tipping it is necessary to start in the beamhouse, says an old tanner. It is impossible to make good tipping leather with the same beamhouse method that is used to make old-fashioned upper leather. The reason is this: Tipping leather must be soft and a very small amount of oil can be used in stuffing it. Another thing that must be remembered is that tipping leather is always a light gauge leather, and in order to have it thin and fairly strong, the grain on the leather cannot be too heavy. If it is heavy, when the leather is split for tipping the tipping will be seven-eighths grain and one-eighth fiber, consequently you get a very tender piece of tipping.

BEST TIPPING.

The best tipping on the market today is that made in Newark, N. J., and the reason is not because they are old hands at japanning, but because the tanners work their beamhouses so as to get their leather mellow to start with. Years ago when there was plenty of old-fashioned tanned rough leather on the market, it was no trouble to make good tipping from it. Why? Because it was worked the old way. It was not hustled through the beamhouse in four days; it was limed slow and with weak limes; it was bated low with a manure bate, and it was worked over the beam by hand and all the sand and fine hair is removed. Then you will have a nice, soft, flexible grain; a thin grain, so thin that when you split a 2-ounce leather you get some fiber and some strength. I do not believe in sticking to the old-fashioned methods of doing business. I believe in progress, but not so fast that I would kick one dollar bills aside so as to get at a fifty dollar bill a little ahead of the line, and when I reached it find it is counterfeit.

OLD BEAMHOUSE METHODS UPHELD.

To prove that some of the old ways of working the beamhouse are right and that they are not to be turned down if you want to get good strong leather, look at the leather business of Newark, N. J. You can take an eastern tanner or a western tanner through the tanneries in Newark and they will laugh and say, "Oh, how slow the tanners of Newark are. They are fifty years behind the times." Why? Because very little machinery is seen in the beamhouses of Newark. All the work is done by hand. All the hides are green-shaved, that is, the flesh is all shaved off by hand, not scraped off. The hides are limed slow, say eight days, and they are bated low and started in the tan liquor easy. What is the result? It is an easy question to answer. Just look at the reports of the leather business for 1906 and you will see that the Newark tanners made more money

than they ever did before in one year. They show it by the way they are increasing the capacity of their tanneries. Where is there another leather center in which the tanners have increased their business 80 per cent inside of eighteen months?

SOAKING.

As I started to say, you must get the hides right in the beamhouse. To do this, soak them 24 hours, then flesh them and soak 12 hours longer. Now make up your first lime and use 1 per cent of lime for the first pit; allow the hides to stay in the first pit 24 hours; haul them out and give them 1 per cent more of lime; put them back and allow them to lay for 24 hours.

In pit No. 2 use 2 per cent of lime. Put your hides into it and haul them out at the end of 24 hours. Do the same with pits No. 3 and No. 4.

UNHAIRING.

After they have been in the limes eight days unhair them and put them in 80 degrees water for six to eight hours, and then work them over the beam by hand and see how the scud will work out. After they are fine-haired reflesh them on the machine. They are then ready for the bate and the only one to use is a good bacterial bate, pigeon or hen manure. Use the bate at 90 to 100 and do your bating in the daytime, so you can watch just how it is working. When they are bated nice and soft give them a good washing in a wash mill with warm water. They are then ready for the tan yard.

TANNING.

You can start them in a fairly strong liquor and they will tan quite fast. Handle them every day. When they are in from 14 to 18 days they are then ready to split. The grains are retanned in a mill and splits are taken back to the yard, where they are filled up good and hard. They will then make a fine Goodyear split. The grains are retanned in a mill with sumac and quebracho or gambier. Some tanners take them from the machine and mill them up in a weak acid and salt pickle, then give them a retan in chrome liquor for three hours and pile them down 48 hours and wash with a little bicarbonate of soda. They then give them a bath of fustic and a fat liquor.

RETANNING.

The proportions to use of the different materials when retanning with chrome liquor are as follows: For each 50 sides take them from the splitter and mill them up in borax water, using 2 pounds of borax in 50 gallons of warm water 90 degrees. Run them in this

borax water 30 minutes, then drain off the borax water and wash them in clear cold water for 15 minutes. Now take 50 gallons of cold water and dissolve 18 pounds of salt in it, then stir in 3 pounds of sulphuric acid. Run the leather in this acid solution one-half hour; drain off the water and give them a run in the following chrome liquor: 4 gallons of 25 degrees one-bath chrome liquor diluted with 25 gallons of water. Run the leather in this one hour and pile down until the next day, then put it in a wash mill and wash it one-half hour in running water. It is then ready to fat-liquor, which is done in the following manner: 1½ pounds of fig soap dissolved in 10 gallons of boiling water and cooled down to 190; stir in 9 pounds of good moellon degras. Add water to make 25 gallons, have it at a temperature of 120 degrees and run hides in this liquor for one-half hour and drain, mill, then dissolve 5 pounds extract of fustic in 25 gallons of water 90 degrees and run leather in this 20 minutes and pile down until next day. Now set out well and tack on frames. When dry buff off the grain and stake well. The leather is then ready for the japan shop.

FLOUR AS A MATERIAL IN TANNERIES.

The idea entertained appears to be that after all flour as a tanning material is very small, or at any rate not of very apparent utility, and that owing to its cost its use can be limited. In point of fact this idea is put into practical use by many tanners. The question which calls for an answer is, Of what use is flour to the leather? And the answer is that it imparts a whiteness to the leather. It may, however, be said that all tanned leather is white without the use of flour.

FLOUR HELPS PLUMPING.

Skins tanned in salt and alum without the use of flour are not as white, neither are they as soft nor as plump as skins on which flour has been used in connection with the salt and alum. When wool skins, for instance, have been so tanned the wool will scour out white and the pelt be soft. Such skins, receiving no lime, do not give in the working as skins do which have been through the limes and drenches.

BEST RESULTS WHERE FLOUR IS USED.

Two lots of wool skins may be tanned, one lot receiving simply salt and alum, and the other salt, alum and flour, the flour being mixed with the salt and alum and used as a paste on the flesh side of the skins. When the two lots reach the finishing room it will be found that the skins which have not received any flour do not give

when crutched. The grain will crackle every time the crutching knife is drawn across the flesh, and oftentimes before the skin is softened the knife has cut through. Such tanned skins are always tinny and flat. When buffing them on the buffing wheels to remove the flesh, the skin being so hard and thin will not stand the pressure, but will tear easily. On the other hand, the skins which have received the flour give readily under the crutching knife, no crackling of the grain is heard, the skins will be soft and pliable, and on being buffed the flesh side will be white and smooth.

FLOUR OF PRACTICAL USE.

In manufacturing jacket leather flour will be found of practical use when skins are tanned in the drum. It not only imparts body to the skins and causes them to finish mellow and tough, but it prevents the alum from breaking out and causing the skins to open. The reason of this is that the coarse particles of flour not absorbed by the skin take up the alum not retained by the skin and render it harmless.

Some mistaken tanners, no doubt, will say that flour as a tanning material is of mighty little use, and that, owing to its cost, it should only be used to impart whiteness to certain kinds of tawed leather, for instance, glove leather, white alums, etc. All tawed leather is white, but still whiter if flour is used; and a marked difference is readily seen between the leather, not only in whiteness, but in strength and mellowness. If the flour is of no value except to impart whiteness to leather, glove leather tanners would not use it when they know that the skins they are tanning are to be colored black or some dark shade where whiteness in leather is of no account. It is true that the cost of tanning skins is brought up considerably by using flour with other materials, but the saving in labor when finishing more than offsets the increased cost in tanning.

USE THE BEST.

It is not economy to use flour of inferior quality, or when using the best, to try to stint its use. The cheap brands of flour contain a large amount of white clay, which is of no benefit to the tanner. One reason why it is more advantageous to use flour of the very best quality is that only the finest particles of the flour can enter the skin and fill it out and nourish it. The coarser particles, on the other hand, get separated and fall away. Bean meal is often mixed with cheap brands of flour, and it has the peculiar property of attaching itself to the grain of leather and hardening there, so that shaking will not remove it. It forms little globules about the size of the head of a pin, and there is no tool that seems capable of taking them off without considerable damage to the grain of the skin. The damage to a skin

from this cause is large and these little clots of meal are capable of producing no end of trouble in the finishing.

FLOUR IN CURRYING SHOP.

In the currying shop flour is used largely in the paste for filling the pores of leather. It fills up the pores and imparts a body to the leather. Curriers know the value of good flour and will not use cheap grades at any price.

TANNERY HAIR.

Tons of cattle and goat hair are collected from the tanneries and morocco factories annually by men who make a special business of this. The hair is taken direct from the beam in its wet, limy state by the collectors, at so much per bushel. It is carried to a large field and spread out to dry and when partly dry a machine, similar in construction to a hay tedder, which works five or six forks, is driven over the hair. The forks of the machine revolving rapidly stir up and break apart the coarse lumps of hair and also remove a large amount of lime dust. Following this machine is a gang of men beating the hair with hand flails. After the hair is dried it is carried to a shed, where it is pressed into bales of 150 to 200 pounds.

HAIR WASHING MACHINES WORK SATISFACTORILY.

In many tanneries hair washing machines are installed, which thoroughly cleanse the hair from all lime and dirt. The hair after going through the washer is passed on to the dryer and comes out thoroughly dry and ready to be baled.

On reaching the factory where it is to be manufactured into blankets, underwear, etc., the white hair is sorted from the colored. This is more valuable than the colored, since it can easily be mixed with wool without detection and used in the manufacture of bed blankets and underwear. It is this which causes the pricking sensation so often experienced by the wearer of such goods.

Quantities of white hair are shipped abroad and come in the same manufactured article as pure wool. The brown and dark colored hair is used in horse blankets, carpets, felt cushions and felt boots. It is used largely in making collar pads, horse collars and all saddlery goods. I hardly need mention that hair is mixed with lime and sand for plaster.

HAIR WHICH BRINGS BEST PRICE.

The hair which brings the best price is that which comes from the tails and manes of cattle and horses. The tails and manes of horses, being the longest, are considered the best. The hair, not having been

subjected to the action of any alkali, is strong and is used for various purposes—for haircloth, for curled hair and for stuffing mattresses.

The tails are washed, spread out to dry and when dry are cleansed from burrs. The hair is then sheared from the hide covering and the white hair is sorted from the colored. Here, as in the case of the hair which comes from the bodies, the white hair is most valuable.

The price paid to tanners for hair varies according to the price of wool. When wool is high more hair is worked into woolen goods, and the demand is therefore greater. Hair today is bringing a good price; wool is high, and hair which has received nothing but lime is not as plentiful as it was before sulphide of sodium and red arsenic were so freely used.

Red arsenic mixed with lime does not dissolve the hair, but if the hair after being taken from the hide or skin is left lying around it rapidly loses its strength of fiber and decays. To prevent this the hair collector removes the hair every few days and washes and dries it as quickly as possible. Hair which is subjected to the action of sulphide of sodium is reduced to a pulpy state, according to the strength of sulphide used. Even when a weak solution is used the fiber is weakened. This is the reason given by some tanners when asked why they do not use sulphide of sodium.

MANUFACTURE OF SKINS FOR DRUMHEADS.

In the manufacture of skins for drumheads the first thing to be considered is the selection of the skins. Only young calf and goat skins are suitable for the purpose, and in the manufacture of the finest, most musical grade of drumheads only prime young calfskins can be used—the younger the better, since the finer and firmer the skin the more musical the drum. It is important that the skins should come from the backs of perfectly healthy calves, as it has been found that in diseased calves the fibers of the skin have deteriorated. Sometimes, in the cheaper grades of drums, sheepskins are used, but the sheepskins are too spongy and coarse-fibered to be sufficiently resonant. It is important that the skins should be secured while in the green state, since, if salted, the salt has a tendency to make them porous, and, if dried, they lose in firmness during the soaking operation, it being necessary to dissolve out so much of the hide substance or corium in order that the skins may be sufficienly soft.

CURING.

After the proper skins have been selected, the next thing to be considered is the manner in which they shall be cured—it can hardly be called "tanned," since the process is not for the purpose of con-

verting the skin into leather, but for the purpose of depilitating and preserving it; one of the requisites being that it shall when finished be in the dryest possible condition. In the preparation of the skins they must first and foremost be absolutely clean.

CLEANING.

To free the skins from blood and dirt they should be soaked in clean cold water to which a little borax has been added. The water should, if possible, be soft; but whether soft or hard the borax greatly improves it for this purpose.

LIMING.

The skins should next be limed. Now, in liming the tanner should bear in mind that the skins should be swollen only so much as is absolutely necessary for the purpose of removing the hair, since every particle the skin is plumped beyond this point is at the expense of the resonance and quality of the sound. The more hide substance or corium dissolved and the more the fiber bundles are split up, the less firm and less resonant the skin becomes. The limes for these skins must be new, fresh limes containing no organic matter. The lime should be carefully slaked and the solution made very weak; to this should be added a small amount of sulphide of sodium. If this solution be of the right strength, the skins will unhair in from two to four days, during which time, if in still limes, they should be hauled out and set back frequently, and if in paddle wheels they should be paddled an hour or two each day. After liming the hair is removed either over the beam by hand knives or by the use of the unhairing machine. After this the skins should be washed and thoroughly fleshed. They are next bated for the purpose of killing the lime. After bating the skins are washed, and in many instances the grain is removed. If the grain is to be removed care must be taken that no holes be made in the skin, since a single hole will mean the ruin of the skin for drumhead purposes. Before drying, the skins should be tacked on boards, smoothly, taking care that each skin is thoroughly stretched before nailing, and left until thoroughly dried.

TO AVOID SPOTS ON LEATHER.

Tanners who are using sulphide of soda in their beam houses often have trouble with spots on the grains.

TWO KINDS OF SPOTS.

There are two kinds of spots they have to contend with; one is a dark green spot, which is caused by the iron in the sulphide or by

the hide coming in contact with iron while it is going through the beam house, such as laying on an iron pipe or any kind of iron. A little precaution will overcome that. Now the iron in the sulphide can be overcome by taking a clean barrel, knock out one head, bore a hole about 4 inches from the bottom, put in a wooden faucet. Put in 150 pounds of sulphide of soda and 25 gallons of water, dissolve by boiling, then fill up to make 50 gallons in all. Now allow it to stand 48 hours to settle, when it will be ready to use. Do not disturb it and the iron in the sulphide will all go to the bottom of the barrel and you can then draw off through the faucet the sulphide solution, which will contain 3 pounds to every gallon. When it gets drawn down to the faucet, the remaining solution, which contains the settling, is thrown away.

The other spots are found by tanners using vegetable tan liquors, and will appear after the hides have been in the first liquors two days. They will look just as if the hides had grease spots on them and the tan liquor will have no effect on those spots.

CAUSE OF SPOTS.

The cause of these spots is from the hides not being washed enough after being unhaired. If sulphide alone is used for unhairing, some kind of a neutralizing agent should be used. This method will give fine results on all kinds of hides. Make up a sulphide liquor 1½ degrees Baume scale; put in the hides and stir them three times a day (a paddle wheel is the best); allow them to remain in the sulphide two to three days, then take them out and wash in wash wheel with a generous supply of running water for a half hour, then put them in a tight drum with a solution of bicarbonate of soda made as follows: 3 pounds bicarbonate of soda dissolved in 12 gallons of water, 80 degrees, for every 100 pounds of hide, green salted weight, and run half an hour; then drain and wash in clear cold water for five minutes.

READY FOR BATE.

They are then ready for the bate. If sulphide and lime are used the hide should be washed for half an hour in a wash wheel with a generous supply of running water. You will have no trouble with untanned spots if the hides are well washed.

To make a solution of lime and sulphide, always slack your lime first, then add your dissolved sulphide to the lime and mix well.

PALMETTO TANNAGE.

Among the various vegetable tanning materials there is nothing better for soft leather, either black or colored, than palmetto extract.

For calfskins and kangaroo skins as well as side leather this tanning material is one of the best that can be used. The beamhouse processes are the same as for a gambier or chrome process. Sulphide of sodium or red arsenic should be used in the limes and the liming should be very thorough, also the bating and drenching, which may be done with any good bate or with the bran drench or with lactic acid. Sides should be split out of the lime, then bated and drenched.

DRUM TANNING.

The tanning is done in a drum, although vats can also be used, but more time is required with vats than with drums. The tanning is begun by paddling the skins from thirty minutes to one hour in cold palmetto liquor 8 degrees Bark strength. The skins are then transferred to the drum and tanned therein in lukewarm liquor 30 degrees Baume 51 T. Sixty-five pounds of extract are required for each hundred pounds of skins. The leather will be tanned in six hours. It should then be pressed and shaved and retanned in the drum in a liquor of 30 degrees Be. or 51 T. strength. The leather is then washed, fat-liquored and dried out.

FAT-LIQUOP.

As a fat-liquor use one pound of soap and one quart degras for one hundred pounds of leather at 120 degrees. Rinse the leather after fat-liquoring in warm water, set it out and dry it thoroughly.

FOR BLACK LEATHER.

Moisten the dry skins thoroughly, stain the flesh, black the grain, oil it lightly and dry it out for the final finish, which may be either glazed or dull.

FOR COLORED LEATHER.

Moisten the dry skins thoroughly, then run or mill them in a sumac liquor—six ounces of extract of sumac, drum the leather twenty minutes and then add three ounces of antimonine per dozen dissolved in warm water, mill the leather twenty minutes more, rinse it off, color with aniline, rinse it again, dry it out and finish any desired way.

WHITE LEATHER.

Work the skins through the beamhouse by the following method:

Calfskins are soaked well and fleshed clean, then lime ten days, using 10 per cent of lime and 2 per cent of sulphide of sodium. Start them in 2 per cent of straight lime, give 2 per cent of lime the

second day and allow them to stay in two days; then put in 2 per cent of lime and 1 per cent of sulphide.

The sixth day give 2 per cent of lime and 1 per cent of sulphide and the eighth day 2 per cent of lime, and unhair on the tenth day. Haul the skins, plunge the lime every day. When unhaired wash in warm water twenty minutes, then bate until good and low. Wash from the bate for ten minutes and pickle with 1 per cent of sulphuric acid and 15 pounds of salt, using 15 gallons of water to each 100 pounds of skins.

RUN IN MILL.

Run in mill one hour and horse up smoothly for 24 hours; then take 12 pounds of sulphate of alumina (German) and dissolve by boiling in 10 gallons of water and pour slowly into the mill to cool, then take 24 ounces of good bicarbonate of soda and dissolve in one gallon of water and pour slowly into the alumina liquor, stirring all the time. Great care must be used in the operation, for if the soda is added too fast it will spoil the tan.

DRUMMING.

After the skins have been horsed up 24 hours place them in the drum with 10 gallons of water, into which have been dissolved one pound of Glauber's salt and three pounds of common salt. Run skins in this Glauber salt solution for 20 minutes and drain off the liquor. Then put the plug in the mill and add 10 gallons of water 75 degrees Fahr., into which have been added four pounds of salt. Run in this 15 minutes and then add half of the alumina and bicarbonate of soda solution and run for three hours. Take out and horse up over night. The next day hang up and dry. When dry put back into mill with eight gallons of water and run 10 minutes; then add the other half of the alumina and bicarbonate of soda solution and run three hours. Horse up 24 hours and hang up to dry.

ACID FAT-LIQUOR.

When dry dampen down and fat-liquor with the following acid fat-liquor. Much care must be exercised in making the acid fat-liquor so as not to burn the oil while adding the acid: Take a barrel and saw in two parts. Cut just below the two hoops near the top. Then put a 15-gallon crock into the half barrel and fill the barrel with cold water. If the water is not below 60 degrees Fahr. add ice to bring the temperature down, then put six gallons of No. 2 castor oil into the crock and allow it to stand over night so as to become perfectly chilled.

USE OF SULPHURIC ACID.

Now take six ounces sulphuric acid and pour slowly into the oil, stirring all the time, and stir at least five minutes after the acid has been added. Start putting the first portion of acid in at 8 o'clock in the morning and at 11 o'clock add six ounces more of sulphuric acid. At 3 o'clock another six ounces of acid are added, and at 6 o'clock six ounces more are put in. Stir well while adding the acid each time.

The next day start in at 8 a. m. or 7 a. m., if you can, and add six ounces of acid, and every three hours thereafter add six ounces until 24 ounces have been given the second day.

OIL WITH ACID.

On the morning of the third day take a clean barrel and put a wooden spigot into it as close to the bottom as possible, and stand the barrel on a box or block about six or eight inches high. Now pour the oil with the acid in it into the barrel and fill the barrel two-thirds full of water 85 degree Fahr. Add to the water and oil 30 pounds of salt and stir well for 10 or 15 minutes. Do this every half hour for five hours, then allow the oil to rise to the top and draw off the water from the bottom. Watch the water as it comes from the spigot, and when the oil starts to come stop it. Then fill up the barrel with warm water same as at first washing and add 24 pounds of salt and stir well same as for first washing. Allow to stand over night after last stirring, and in the morning draw off the water and fill up with warm water and add 18 pounds of salt and stir same as before. Then draw off the water, fill up same as before and add 15 pounds of salt. Stir well and allow to stand over night. In the morning draw off the water and the task is completed and the oil is ready for use.

FAT-LIQUOR.

Now for each 100 pounds weight of skins in the crust take seven pounds of the sulphurated oil and stir it into eight gallons of warm water, 95 degrees Fahr. Put this into the mill and run the skins into this fat-liquor 35 to 40 minutes. Then horse up and draw over night. The next day set out on the grain and oil off with French chalk, two parts of glycerine and four parts water. Give a liberal coat and hang up to dry. When dry dip in warm water and roll in a tight roll over night. Then stake and tack on boards. When dry, if they are not soft enough, restake; or if they have the appearance of not having enough fat-liquor they can be put back and refat-liquored. The same thing can be done if they look as though they were not full tanned. They can be wet back and more of the alumina and bicarbonate of soda solution given to them. It is better to allow the skins

to lay in the crust at least a week before fat-liquoring; 10 days is better.

PICKLED SHEEPSKINS

can be treated this same way, with the exception of taking the skins in the pickle and drying them, then degreasing in naphtha so as to remove the sheep grease. If it is allowed to stay in the skins they will not be white, but a dirty yellow.

We have had fair results by putting the sulphurated oil in with the alumina and bicarbonate of soda solution, and fat-liquoring at the same time as tanning. If this is done the oil must be added to the tan liquor when the last portion of tan is given to the skins.

TO TAN PIGSKINS.

For fifty large skins, soak and flesh before unhairing to remove hair and preserve the skins. Take 100 pounds of Stone & Timlow XXXX depilatory and add to 700 gallons of water in a paddle wheel. Put the skins in this bath and turn for 36 hours, or until all the hair is dissolved and the hides are ready for the lime. Make a bath of lime in a wheel same as above. Slack 100 pounds of lime to 700 gallons of water and turn the skins in the lime for two days, or until plump as you desire, and the hides are ready for the bate.

BATING.

Take 50 pounds of bran, soak in warm water until fermented, and put this bate in paddle wheel, with 700 gallons of water. Add 10 pounds of sulphuric acid, and turn the skins in the bate for 36 hours, or until they are bated low enough to suit the operator. This bate is harmless. Now work out over a beam all lime, dirt and oil on flesh side with a union worker and the stock is ready for the scudding table. Use a hand-glass and set with dull, smooth edges as the grain is easily damaged in this stage. After scudding until all dirt and stuff is out of the grain the skins should go in clean, warm water and are then ready for the tan.

TANNING.

Take for first bath, 700 gallons of water in paddle wheel; add enough quebracho extract to make four degrees barkometer. To this add 10 pounds of flour alum and 25 pounds of salt while warm and plunge same until well mixed. Start the wheel and throw in the skins and turn for 36 hours or longer, which will strike the skins a beautiful light oak color and they are then ready for the second bath. Take the same amount of water, add enough quebracho extract to

make it six degrees barkometer and leave out the alum and salt. Turn 36 hours, then strengthen to ten degrees barkometer and skins hides about two days, which will complete the tanning.

Draw the skins and then sumac same as other skins, oil with neatsfoot oil on grain and hang up to sammy, or tack on frames. Take the skins from the sammy stage, stake and board and the skins are ready for any or all finishes. They can also be bleached to any desired shade.

The above recipe makes a fine natural high grain and free from spew, also firm and strong.

RAW HIDE LACE LEATHER.

After stock has been treated in beam house and ready to tan, take 50 sides that will average 12 feet in a side.

First dissolve 15 pounds of alum, 30 pounds of common salt. Leave in pit for 24 hours. Run off the liquor and give 25 pounds of alum and 50 pounds of salt and handle twice a day. Leave in three-quarters of day. See that they are tanned through. Then take out and hang up to dry. Then dampen down for two or three days, and then break them on the staker. Then take 50 pounds of white tallow and two quarts of pine tar. Have grease quite hot and give coat of same on both sides. When you have 50 pounds treated in this way, put them in the wheel and have the heat from 80 to 85 degrees and let them run one hour with the door on and 15 minutes with the door off. Then stake on flesh side and restuff same as before and set out lengthwise of the flesh and grain. Hang up to dry by neck and tail, do not hang on sticks.

PREPARING HOGSKINS FOR TANNING.

A fine piece of leather may be made out of hogskins if they are properly treated in the beamhouse. They must above all things be perfectly degreased, and if this is not done before liming the skins it will produce a hard leather.

SKINS WELL SCRAPED.

Before the skins are soaked, all grease must be scraped out, and this work must be done well. Care should be taken by the workmen not to make more holes, as there are enough already. After the skins are well scraped out dry, a solution of sal soda is to be made (about 4 to 5 pounds to a barrel of water). This has to be warm, 95 degrees F., then pull the skins one by one through this water, take them on the beam and strike out thoroughly and the grease will flow

out as lime, but the water must be kept warm enough to loosen the fat. Each skin must then be washed in the same solution to free it from grease which comes by working in the hair.

SOAKING.

Then the skins may be soaked from twelve to twenty-four hours and put in arsenic or sulphide sodium and well handled for about four days, after which they should unhair easily. After unhairing, bring them in a weak white lime for one day and then transfer to stronger lime, or strengthen the lime up.

Leave the skins in there four or five days, but handle some, then wash lime off and scrape flesh side again. Some of the hairs that may be broken on the grain should be removed from the flesh, and at the same time all greasy matter will come out. Then pull the skins through water and bate in either bran drench or lactic acid. The bran bath must be warm, about 85 to 90, and a paddle wheel used, or by throwing the skins in the bath two men with plungers have to keep the skins moving and for at least one-half hour longer. After they are well bathed, which a tanner should know, they are fine haired.

UNHAIRING.

The unhairing and fine hairing should be done with a stone, so the grain will not be injured. After all the lime is removed out of the skins, they are washed and ready for tanning. Should a clean, light color be required, a pickling would be good to bleach the skins before tanning.

TO ILLUMINATE LEATHER.

The furniture leather is made by applying the necessary dyes to the skins when they are in a dry condition with a swab or brush; then in order to hold the colors so that they will not smut or rub off an application of a special prepared dressing is made which will hold the colors. In making the illuminated gold and silver bronze effect on leather the gold or silver is applied after the first or second coat of color is put on, it must be wet with dye when the bronzes are put on and before any other operation is performed it must be thoroughly dry. Then when dry, an application of the specially prepared dressing may be put on. It may be necessary to make two or three applications of the dressing on some colors, as some colors rub off more than others.

CHAMOIS SKINS.

It is not an unusual thing in a shoe shop to see an operator take a piece of chamois to wipe off a color stain. This should never be allowed. Chamois was never intended for any such purpose, and when so used it soon becomes hard and useless. Chamois skins are frequently used until they become so thoroughly soiled that it is impossible to use them any longer in that state. They are then thrown away. This is needless, as, by a simple process, they may be made to last for some time after they have reached this seemingly impossible stage.

HOT WATER SHOULD NEVER BE USED.

In cleansing a chamois skin hot water should never be used, as it makes the skin hard and harsh. The skin or skins should first be immersed in clean tepid water, to which sufficient ammonia has been added to make the water fairly strong. After remaining in this for a few hours, they should be taken out and soused back and forth in plenty of tepid suds made from any good white soap; then rinse thoroughly, and when dry the skins will be found to be soft, pliable, free from lint, and quite as serviceable as when new.

Sometimes skins are sold as chamois when in reality they are only alum tanned skins in imitation of genuine chamois, and not oil dressed. Skins for chamois leather are subjected to prolonged liming to increase their suppleness and also to have the grain give easily in the unhairing.

USE OF COD OIL.

After the liming process has been completed and the water in the skins thoroughly removed they are placed in the stocks, where they are subjected to a beating. As the skins go back and forth cod oil is gradually sprinkled over them, which is forced into the pores of the skins. When the skins commence to overheat they are taken from the stocks and allowed to cool. They are then placed in the stocks and the process is repeated until the skins are tanned. The skins are now allowed to cool off and are then placed in water heated to 120 degrees F., and then are placed under a hydraulic press to remove the grease. The press takes out a large part of the oil, but to remove the remainder a washing in a solution of soda ash is resorted to. The skins are now dried in the air and finished.

The oil gives a yellow color to the skin, and if wanted white the skins are subjected to the action of sulphur fumes.

DRYING LEATHER.

We often hear the remark that leather is made in the beam house, and while it is, in a way, true, it is also in a way not true; or, if it be wholly true it is very evident that there are various stages at which the unfinished product may be unmade. Of course we all know, or should know, that hides or skins which have not been properly handled in the beam house can never be made into first class leather.

EXPERIENCE AND VIGILANCE NEEDED IN BEAM HOUSE.

Experience, vigilance and good judgment are needed in the beam house, but so, also, are they needed in most of the operations following those in the beam house.

A hide or skin may be well beamed and well tanned and then entirely ruined, so far as appearance goes, in the drying. Although we are very much in the dark as to the chemical change that takes place in a hide or skin during the tanning process, yet it is evident that some of the tanning compound attaches itself to certain particles of the hide and that some of the compound is held unattached in the interstices.

Now in drying we should so dry the sides of leather or skins as to bring to the surface the smallest possible amount of this unattached tanning material, and we should also dry them in such a manner that they come out soft and flexible instead of hard and brittle.

In drying leather not only must the degree of heat be taken into consideration but, also, the amount of moisture in the atmosphere. The man who attempts to govern his drying wholly by the thermometer makes a great mistake. So also does he who places wet skins in the room with those which have been partially dried. Particularly is this the case if the skins are intended for colors. As the wet skins give up their moisture it is absorbed by the skins which have been partially dried, and this causes a variation in color.

ATMOSPHERE MAY BE REGULATED.

Artificial heat at high temperature does not insure rapid drying, any more than it insures uniform drying, but by the judicious placing of fans the atmosphere may be regulated to meet the requirements of any particular lot of leather. No hard and fast rule can be given here, but it is an excellent idea for the man in charge of the drying to have a book in which he jots down the condition of various lots of leather, the atmospheric condition, etc., and the results obtained.

SKINS FOR FANCY LEATHER REQUIRE CAREFUL DRYING.

In drying a given lot of leather, the purpose for which it is intended must always be taken into consideration as well as the condition of the leather. On skins to be used for fancy colors the drying must be exercised with the greatest care. Not only is the color greatly affected by the manner in which they are dried, but as they are given no oil after being dried, their softness and flexibility depend, in a degree, upon the manner in which they are dried. The heat and moisture should be controlled and the skins should be protected from direct rays of the sun. Another class of stock which should be protected from the direct rays of the sun is sole leather. In some of the best regulated drying rooms the windows are painted.

Sole leather is one of the most difficult leathers to dry successfully. So long as sole leather is sold by weight so long will good weight be a prime consideration, and so long will the strongest possible bark liquors be set to it. The stronger the bark liquor used the more tannin there will be in the free interstices of the leather, and, if this be dried out too rapidly, the water will, as it evaporates, carry the unattached particles of the tannins to the surface and thus cause the leather to be "off color" and brittle.

FANS WELL PLACED.

I have spoken here of the judicious placing of fans. Fans are well placed when their position is such that a fresh supply of oxygen can enter the fans and be well distributed. This distribution of oxygen means much in the drying room. On leather that has been oiled the oxygen, if the degree of heat be right, assists in the penetration of the oil as the water evaporates. There is a great difference in a side of leather or a skin which has been so dried that the oil has fed and nourished it and a side or skin so dried that the oil is merely coated over the outside. When coated over the outside the leather has a shriveled, drawn appearance. In all cases on either oiled or stuffed leather it is important that the oil or grease should penetrate the leather slowly and evenly, taking the place of the water as it is evaporated.

HARDENING LEATHER.

To harden welt leather melt 200 pounds of grape sugar in a kettle with [illegible] gallons of fish oil. Heat to 135 degrees and heat mill to 150 degrees. Put 18 per cent of this mixture to 100 pounds of welt leather. If properly done this will produce nice, firm welting.

To harden harness leather, in hot weather, here is a recipe which will give the best results: Melt 200 pounds of stearine and 50 pounds of paraffin wax in a kettle at about 135 degrees. Then heat mill to

150 or 160 degrees. Add 20 per cent of this mixture, or 20 pounds of it, to every 100 pounds of wet harness leather, which is all ready to stuff. If this proportion is not enough, make it 25 per cent. Mill the leather for 30 minutes and then remove, hang up to cool, and in due course it will be ready to set.

HINTS ON LEATHER SORTING.

It seems almost impossible for anyone to define a fixed rule or prescribe a permanent standard to be followed by tanners in sorting their leather, even though their product may be virtually the same in appearance and quality. The value of the goods is the first consideration in determining the run of a certain line of stock, but many things of vital importance are ignored by some tanners which it may be well to point out.

CLASSIFICATION OF HIDES NECESSARY.

In a well regulated tannery a classification of the hides or skins becomes necessary at every important stage of the process, in order to lead the stock into its proper channels and thereby reduce the difficulties of manufacture to a minimum, and assuring the best product under the process employed.

To begin with, fine or coarse, fat or hungry hides and skins will all make up reasonably well when put into their proper tan or finish, but cannot be expected to turn out well when given improper treatment, therefore a judicious selection becomes necessary at the first stage, namely, in the hide house.

In reference to skins this is especially true. One kind may do very well and yield good profits in a gambier or combination tannage with a dongola, kangaroo or Russia finish, while it may prove a disappointment or even a loss in chrome. And the same fact may also be applied to hides. One treatment for a score of evils will never do. As in medicine, tanners have no cure-all, therefore it must be left to the good judgment of a tanner to assort and treat his hides to the best advantage.

According to their nature, hides and skins should be treated in the beamhouse and equal results cannot be expected by working large and small or fine and coarse together; hence the importance of the first classification.

After being unhaired, the stock is in a different condition and before introducing it to the various tannages, sorting becomes necessary again, as it is impossible to judge every hide or skin correctly with the hair on, while in the course of the beamhouse work new defects or advantages may have been added.

SELECT STOCK PREVIOUS TO SPLITTING.

Then as he goes along, the successful superintendent finds it advantageous to select his stock previous to splitting and shaving, as the ultimate finish is often much affected by the manner in which this work is done. Therefore a judicious classification is evident until the final sorting table is reached, and the best results possible obtained.

In all successful tanneries these methods are more or less carried out, but it is really surprising to note in this respect how frequently a "good thing" is spoiled.

A sudden large order for a certain kind of leather often induces a manufacturer to rush everything one way and run stock into finishes for which it is quite unfit. The result generally is that the order remains as far from being filled as under ordinary conditions, and an undesirable lot accumulates.

One of the largest, most progressive and undoubtedly best managed tanneries in existence is exceedingly careful in selecting and classifying its stock from beginning to end, the result being that aside from the high reputation of their product, fewer job lots are turned out than in most establishments of one-fourth its size.

The final assortment or selection, that is, before the leather is offered for sale or placed in stock, is of the greatest importance as far as a permanent unchangeable standard is concerned, and a good judge of leather with a firm decision is best adapted for this work.

UNCHANGEABLE RUN OF STOCK SECURES CONFIDENCE.

A closely selected, unchangeable run of stock arouses the greatest amount of confidence on the part of the shoe manufacturer, therefore too much importance cannot be placed upon this fact.

Shoe factory calculations are probably closer than in any other line of business, therefore any change in selecting a run of stock will surely be noticed.

A rise in the price of raw stock, without immediate signs of relief, induces most tanners to run their selections several per cent poorer, calculating that in this manner the difference could be made to balance.

During a decline in the raw stock market shoe manufacturers usually demand better qualities and prices, and on these occasions as a rule the tanner runs his selections somewhat better, but the result of these proceedings can easily be imagined.

Of the leather sorted at these two periods a certain percentage is always piled away for future delivery or sale. The poor and the good assortments of the same selection are mixed in one heap and this fact causes many of the troubles between the tanner and shoe manufacturer, as well as between salesman and buyer.

The fact that these fluctuations in selections, as they might be

called, exist, cannot be denied, and the troubles they cause are well known.

EUROPEAN TRADE DEMANDS EVEN RUN OF STOCK.

The European trade, especially the German, is always very firm in its demand for an even run of goods, irrespective of any market conditions, and much of this trade has been lost by allowing the selections of different shipments to vary.

Buying and selling of leather would be much simplified if based on reliable selections, and those who strenuously adopt this method will be well rewarded.

CHAMOIS LEATHER FROM SHEEPSKINS.

Thousands of sheepskins are tanned annually for chamois leather. Among eastern tanners a great many fleshers are used for making imitation chamois leather. These fleshers are the splits taken from the sheepskins while they are in the green stage. These are imported from England, ready split.

SPLITTING.

The splitting is done on a machine with a vibrating knife, which cuts a small amount at each vibration. It is claimed by those who have seen this splitting of the raw skin that it is the rapidity with which the knife moves and the small amount of cutting done at once that makes the splitting operation successful.

The grain split is called a skiver and is used for various purposes, being tanned in bark, sumac or alum. The other part is the flesher and is the stronger of the two. This is tanned in a combination tannage for imitation chamois. It is used for linings of pockets, shoes, etc., and is a cheap substitute for the genuine chamois.

Some tanners, after a good milling, put the fleshers in sumac liquor for a day or two to plump them, and then finish tanning the skins in a drum with a liquor made up of alum, gambier and a small quantity of oil. The color is produced by the use of an aniline. The skins are dried out after being tanned and then dampened for knee staking. After knee staking they are dried again and buffed on the flesh.

GENUINE CHAMOIS LEATHER.

Genuine chamois leather is made from the skin of a certain kind of goat found in western Europe. These skins are very difficult to obtain, owing to the shyness of the chamois and their acute sensibilities. The chamois are accessible to hunters only for a season during the winter months, when coming down from the mountains. Even then it is nec-

essary that a large party should go out if they are anxious to meet with any degree of success.

TANNING SKINS IN OIL.

Genuine chamois leather is the product obtained by tanning these skins in oil. After the beamhouse work has been done the grain of the skin is removed by pumice stone, which not only softens the surface, but increases the flexibility of the skin. The skins are then put through the wringing machine to remove as much moisture as possible preparatory to giving the oil. A number of skins are then spread on the table and oil rubbed on the grain side. They are then folded in the form of a ball and placed in the pulling mill. The feet of the mill working back and forth cause the skins to keep turning over and over and to heat. When the skins have reached that stage where they are liable to burn they are taken out and allowed to cool, then oiled and pulled again. This oil and pulling is repeated several times. After this the skins undergo a fermentation, which enlarges the pores and causes the oil and the gelatin of the skin to combine. This fermentation is brought about by hanging the skins in a hot room.

After the proper stage of fermentation has been reached—experience must determine this—the skins are scraped with a knife to remove the remainder of the cuticle, and then are freed from oil either by pressing or by scouring in an alkaline solution. The skins are then dried, knee staked, buffed and sorted.

BLEACHING AND CLEARING LEATHER FOR COLORING.

There is much difference of opinion as to the best methods for bleaching and clearing leather for coloring. No one denies that the best results are only obtainable when the leather is properly prepared for the dye bath. Numerous bleaches have been introduced; some of them are good, others are dangerous. The prevailing tendency is to use the milder bleaches, containing clearing and cleansing qualities, instead of the severe bleaches which it was formerly considered proper to use.

SUMAC AND ACID AND SALT PROCESS.

Combination tannages, intended for Russia leather, are liable to be permanently injured in efforts to change the natural tan color, but the skillful tanner today has methods which are safe and satisfactory. One of the most popular and effective but most harmless bleaches is that known as the sumac and acid and salt process.

FORMULA.

2 pails of dry Sicily sumac.
16 ounces sulphuric acid.
4 quarts of salt.

This compound is intended for 150 pounds of dry leather which has had all the fat-liquor it will absorb. The leather is taken to the mill and wet down with nine pails of water at 90 degrees heat. The sumac is put in, then the salt, and then the acid. Run the mill thirty minutes, then wash thoroughly for fifteen minutes, then give a wood bottom to color on.

The main objection to this bleach is that all the acid cannot be washed out, so that the skins when dry are in a strawy state, which is unnatural for this kind of leather, which will not take oil as it should. Furthermore, when dried it will be found that the colors have not penetrated very deeply, and this is a serious fault and liable to cause complaint from leather buyers. Also after drying the colors need a metallic or alkali set. The real bleaching agent of this process is the sumac, the acid is for clearing the grain, while the salt neutralizes the acid and keeps the skins open.

BETTER FOR BARK TANNAGES.

The bleach described is better for bark tannages than for combination tannages. But the ideal process of all for combination tannage is the alum and salt process. It is simple and more of a cleanser and cleaner than a bleach; and its effective work so improves the texture and color of the leather than no wooden bottom or set will be required after the use of this process, which is applied previous to its being fat-liquored.

FORMULA.

Dissolve together 3 quarts of ground alum and 5 quarts of salt. This will suffice for 150 pounds of dry leather.

Put nine pails of water at 90 degrees heat in mill with the leather and add the alum and salt. Run mill fifteen minutes, then wash for ten minutes and the leather is ready for the first fat-liquor. The latter is made with sulphate of oil. The leather is now dried out and is ready for setting, as the main fat-liquoring should be done after the skins have been dyed and dried, so that the coloring will be well set.

The dye, by striking through and through the leather, assures the color from being fugitive, and this valuable property accounts for the alum and salt process being used more exclusively in combination tannages of Russia leather and leather for fancy colors.

BORAX AND LACTIC ACID PROCESS.

The next best bleach that is used with success on combination tannages is the borax and lactic acid process. It is effective and harmless and is often called the sour mash bleach, because one bushel of rye bran is put into a barrel filled with water, and remains until fermentation takes place; then it is ready for use.

FORMULA.

Dissolve 4 pounds of borax. Use 3 pails of bran liquor.

This mixture is sufficient for 150 pounds of dry leather which has had all the fat-liquor it will take. Wet down and put in mill with nine pails of water at 90 degrees temperature. Add the borax and run the mill ten minutes; stop and throw in the bran liquor and run fifteen minutes longer. Then wash out thoroughly and give wooden bottom before coloring. Use alum set after dyeing. This process is highly recommended, as the borax is an excellent cleanser and saponifies the surplus fats which otherwise might remain in the skin and make it look cloudy.

The lactic acid opens up the skin and spreads it so that bright and clear shades are obtained without harming the leather.

OXALIC ACID AND TIN CRYSTAL PROCESS.

Here is another bleach known as the oxalic acid and tin crystal process. Sometimes the acid is used alone, but it does better work in conjunction with tin crystals.

FORMULA.

Dissolve 16 ounces of oxalic acid and 8 ounces of tin crystals.

This is a quantity sufficient for 150 pounds of dry leather which has had all the fat-liquor obtainable. Wet down by putting in mill with nine pails of water at 90 degrees temperature, and adding the mixture mentioned. Run twenty minutes. Wash thoroughly and give wooden bottom before coloring. Use set after dyeing. It is claimed this bleach has wonderful effect in making clear grain, and beautiful colors can be made with it. The great drawback, however, in using this process is the dry, harsh, strawy feel it leaves in the leather and the fact that leather thus treated does not let the dye penetrate deep enough, so that the color on such stock is inclined to be fugitive. This process, however, can be recommended for bark-tanned leather, but it is less desirable for combination tannages.

STICK TO THINGS THAT ARE ABSOLUTELY SURE.

Of late years a number of preparations with fancy names have been put on the market which contain metallic and acid salts, but

great care should be exercised in using them, as too often manufacturers of materials for tanners and curriers are so anxious for novelties that they are liable to forget the importance of sticking only to things that are absolutely sure and safe. Injurious materials are bound to be found out sooner or later, but expensive damage is liable to be caused by them meanwhile.

DEFINITION OF SETS.

All leather that gets all the fat-liquor it will take before being bleached and dried needs what is known as a set or treatment by metallic or alkali salts after the dyeing. All leather that is processed, dyed and dried out, then given the necessary fat-liquor, needs no set whatever. And the after-effects are much better for it. Special care must be paid to the dyestuff, so that it will stand the oil without flinching, so that all trouble will be avoided.

The oils best suited for making fat-liquors are neatsfoot, deodorized cod, cottonseed, English sod oils and French moellon degras.

All of these fats should be cut with borax or soda ash or sulphated. The best soaps are the vegetable oils and the borax soaps.

DYEING OF RUSSIA LEATHER.

In the dyeing of Russia leather many methods are employed to produce different shades according to the ideas of the dyer. Different dyers employ different methods in order to get the same effect. It is well known that a certain shade can be obtained in many different ways.

Shades are classed into five different groups, viz., reaction light, middle, dark and compound shades. To make the reaction shades it is necessary to bleach with borax and lactic acid, which will bring the color to a nice clear buff. This is the best bottom for this shade.

REACTIVE SHADE OR STEEL GRAY.

FORMULA.

2 pails of logwood.
3 pails of fustic.
1¼ ounces of fast blue.
3 ounces of picric acid.
4 quarts of sumac extract.

To the above should be added 16 ounces of copperas dissolved in hot water and employed as a striker.

This is sufficient for 150 pounds of dry leather. Wet down and put in with ten pails of water altogether, at 110 degrees temperature,

and run twenty minutes. Let off liquor; then dissolve the copperas, which should be put in the mill with eight pails of water at 90 degrees heat. Run five minutes; draw off liquor and wash well. Take leather out; set on flesh and grain and then tack or stretch out on a wooden frame. The copperas acts as a set for the color in this shade.

LIGHT RUSSET.

Add three pails of fustic liquor and eight ounces of alum together, and to this mixture put nine pails of water and run them in the mill for fifteen minutes at 90 degrees.

Dissolve 18 ounces of Philadelphia yellow, 13 ounces of Nankin yellow, and 6 ounces of cream yellow. Add nine pails of water, and run this mixture for 20 minutes at 110 degrees of heat. This shade is set with alum. In the rinsing water a double handful of alum will be sufficient. The bottom is bleached with borax and lactic acid. It should be mentioned that the fustic liquor is made by mixing two pails of fustic extract and two quarts of salt with one barrel of water.

DARK RUSSET.

Take three-quarters of a pail of logwood, and three pails of fustic and run for twenty minutes in mill with nine pails of water at 90 degrees temperature. At end of time stop and let liquor out.

Take 24 ounces of bronze No. 2 and three ounces of acid orange and run twenty minutes in mill with nine pails of water at 110 degrees. Stop and let liquor out.

Take 16 ounces of Nankin yellow Y; 9 ounces of cream yellow, and 2 ounces of Bismarck brown, B. Run in mill twenty minutes with nine pails of hot water. One hundred and fifty pounds of dry skins that have been treated with the alum and salt bleach is sufficient for this mixture. After coloring the leather is hung up and dried out before anything else is done to it. Then take to the mill and wet down with warm water, and well fat-liquored. Set out on flesh and grain, and tack on frame. This dark russet shade does not need any metallic or alkali setting; the fat-liquor acts as a set and answers all purposes. This shade does not require any green to tone it with. The bottom is yellow-greenish and the blue in the bronze dye answers the purpose satisfactorily.

COFFEE BROWN.

Mix one and one-half pails of logwood with three pails of fustic; add nine pails of hot water, and run for fifteen minutes in mill.

Do same thing with mixture of 12 ounces of Nankin N, 12 ounces of Bismarck brown, one-quarter ounce Malachite green.

Third Bath—Twenty ounces of bronze No. 2, and four ounces acid orange.

Fourth Bath—Twelve ounces Nankin N, four ounces Bismarck brown B, one and one-half ounces Bismarck brown R, eight ounces cream yellow.

Run same as the dark russet. Needs no set, as fat-liquor will answer all purposes.

CHOCOLATE BROWN.

First Bath—Two pails of logwood and three pails of fustic. Run twenty minutes in mill with nine pails of hot water.

Second Bath—Twelve ounces of Bismarck brown R, 12 ounces Bismarck brown B, one-quarter ounce Malachite green.

Third Bath—Twenty-four ounces of bronze No. 2, two ounces of acid orange.

Fourth Bath—Sixteen ounces of Nankin N, six ounces of cream yellow and two ounces of Bismarck brown B.

Run same as coffee brown, and set in fat-liquor.

This completes the five different classes of colors—one shade in each color.

First—Reaction shade, or steel gray.

Second—Light russet.

Third—Dark russet.

Fourth—Coffee brown, dark shade.

Fifth—Chocolate brown.

The compound is the chocolate brown. The first two shades are metallic sets. The last three are oil sets, and do not need any black aniline to tone down the shade, as the depth of it was determined at the first, and gauged and run to shade.

VALUABLE TANNERY RECIPES.

STRIKER OF SET.

5 pounds of copperas.
2½ pounds of bluestone.
50 gallons of water.

HOW TO MAKE TINCTURE OF IRON LIQUOR.

4 quarts of nitric acid.
2 quarts of boiling water.

Put in a crock and use new hoop iron. Give it all the iron it will cut and feed slow, so as not to burn.

When all through cutting, let it stand and cool and settle, and then draw off.

OAK STAIN FOR HEMLOCK LEATHER.

13 pounds extract of quercitron bark.
10 pounds of alum.
12 pounds of sumac.

Boil in one-half barrel of water until all is dissolved, and then fill up the barrel with water, and stir well before using. Use warm, say, about 100 to 105 degrees, with a brush after scouring.

In using the sumac, it would be better to have it in a bag. It will take a little longer to get the strength out, but it will not cause so much trouble in straining afterwards.

OIL BLACK.

20 pounds lampblack.
2½ pounds logwood extract.
70 pounds of tallow.
12 gallons good bark liquor.

After mixing, boil for twelve hours, and when cool stir well, to keep from separating. The above black is changed more or less to suit different stock, the same as finishes are changed, as no one finish will work the same on all kinds of stock, and should be manipulated to get the best results.

A SCAR PASTE.

4 ounces extract of logwood.
½ ounce of bichromate of potash.
¼ ounce carbonate of potash.
⅛ ounce of copperas sulphate.
1 pound of frozen glue.
1½ gallons of water.

Dissolve the logwood and bichromate of potash in one dish.

Dissolve the carbonate of potash and copperas sulphate together.

Dissolve the frozen glue in a little water. When all are dissolved, mix well and cool. This is used to cover up scars and scratches, and is put on and dried. Then use vour finish.

A BLOOD FINISH FOR GLAZING.

½ ounce of bichromate of potash.
1 ounce of prussic of potash.
4 ounces of extract of logwood.

Dissolve in two gallons of water, and let cool.

Use for this recipe two gallons of blood, and two gallons of logwood liquor. Mix well and box back and forth.

TO KEEP BLOOD.

Dissolve one pound of carbolic acid crystals in four quarts of water. Put this in one barrel of fresh blood, and it will keep for years.

KANGAROO GLAZE FINISH.

For nine gallons of finished black take the following:

Use 15 pints of ox blood for kangaroo, and for goat skins about 12 to 14 pints. One pint of water and one pint of milk. Two tablespoons of glycerin; ½ pint of orchill (Klipstein's), 1½ pints of nigrosine water (½ pound per gallon); one pint of ammonia (3 F.). Then fill up with strong logwood liquor. This makes nine gallons of finish.

CHROME GLAZED KID FINISH.

3 quarts logwood liquor.
1 quart blood.
¼ pint of orchill.
1 pint of water.
¼ pint of ammonia.
A little milk—say, about ½ glass.

GRAIN BLACKING.

This can be used on all kinds of grain leather.
As a mordant take, say, 50 gallons.
1 pound caustic soda.
1 pound carbonate of potash.
Stain, say, 50 gallons.
3½ to 5 pounds of carvoline in crystals (Pickhardt & Kutruff's).
¾ pound of carbonate of potash.
1½ pounds of fustic.

CHROME.

Some tanners put chrome skins after washing in light sumac for about two hours. This is done to bleach, to partly fill, to soften and smooth the grain. From the sumac the skins may be washed off and dried, colored or blacked. Treating chrome leather with tanning materials tans the grain which, if the tannage is used too strong, will become rough and coarse. A bath with tanning extract, properly applied, is beneficial to chrome leather. Gambier is often used in this connection.

RE-TANNING.

Hemlock-tanned leather, for shoes or harness purposes, gains if re-tanned in a drum with palmetto liquor. It absorbs the grease well,

and takes a fine black. Gambier necks and splits are also benefited by re-tanning in palmetto. Harness leather handled in this manner may be given a coat of soap and moellon degras, and when dried should be stuffed with stearin at 140 degrees. Good harness, strap and fancy belt leather can also be made directly with palmetto tannage, and stuffed in the above manner. Light palmetto-tanned shoe leathers may be re-tanned in sumac before coloring or blacking.

LIVENING LEATHER.

Almost all kinds of leather gain by treating with sumac liquor before coloring. In preparing skins for coloring, mineral acids should be avoided, or results will not be satisfactory. Strong acid bleach gives leather a dry, rough feeling. Leather correctly treated before coloring can then be easily handled.

GLOVE AND MITTEN TANNAGE.

I propose in this article to give some suggestions as to how stock should be prepared and worked for producing chrome-tanned glove and mitten leather, says a practical man.

RAW SKINS MUST BE THOROUGHLY SOAKED.

The raw skins or sides must be thoroughly soaked and well fleshed so as to enter the limes in proper condition. The length of time for soaking depends on the condition of the stock. All practical tanners fully understand the importance of using plenty of fresh water; and after the stock has been thoroughly soaked, it is then ready for liming, and for glove and mitten leather, I advocate slow liming and high plumping. I consider twelve days' liming before removing the hair, and two days after the hair, is necessary. Two days' immersion in strong lime after the hair has been removed brings about the required plumpness.

Glove and mitten leather must have a soft, fluffy feeling when finished, and good liming is supposed to produce this desirable effect. After the liming the stock should be well washed in a slush wheel in clean water for one hour to each mill. The lime must be washed out thoroughly, when the stock is ready for the drench, which can be done in a paddle wheel to better advantage than any other way. Put a bushel of bran in a barrel, and add hot water and let it stand until it is sour. Then add this to the water under the paddle wheel, which should be worked steadily for six to seven hours to get the best results. Take out and let drain. Would suggest that the drench be made up of two-thirds the amount of bran used in the first drench for each pack.

A NEW DRENCH ONCE A WEEK.

A new drench should be made up at least once a week. Sour bran should be kept on hand all the time. After drenching, commence the pickling. For 125 skins or 100 small sides (35 to 40 pound hides), take 50 pounds of salt and 2½ quarts of sulphuric acid. Add sufficient water so that the stock will be well covered. These amounts are necessary for making a new pickle. After the first pickling for each pack of 35 pounds salt and 1½ quarts of acid, add sufficient water for submerging the pack. The paddle wheel, which is by far the best way for conducting the pickling. Leave in the pickle over night, and the paddle wheel should be run at least one hour after the stock is put in and from 20 to 30 minutes in the morning before taking the stock out.

Lay the stock in a pile, evenly spread out for two or three days before tanning. Now weigh the stock carefully before tanning in the drum, which is the best way for making glove leather. More uniform results can be obtained by drum tanning than by the paddle wheel.

Chrome tannage is by far the best way to make glove and mitten leather. If tanners anxious to make chrome leather are ignorant of this method, the safest way is to start with tanolin, which saves the expense of experimenting, as full information is published for whoever purchases this material.

Assuming that the leather has been properly tanned, it should be taken from the wheel and laid on a horse, with each skin or side spread out evenly, so as to drain over night. On the following day prepare for splitting or shaving to the desired substance, and thus make ready for coloring.

COLORING.

Prepare a gambier liquor by dissolving 25 pounds of gambier in a barrel which should be about three-fourths full of water. Boil until dissolved and then add one pint of muriate of tin and three ounces of tin crystals. Then fill the barrel up with water. To every 50 sides, or half pack, give four pails of this gambier solution at 80 degrees of heat, and one pail of water. Run in mill or wheel for one hour. For light yellow color, add one-half pound of picric acid and one-half pound of fustic dissolved in two gallons of hot water, to which should be added one gallon of cold water. Throw in wheel with gambier liquor. Let the wheel run for 30 minutes longer and then take the stock out and let drain on a horse until morning or over night. Now lay in bundles, and pack in a box and leave for twenty-four hours.

FAT-LIQUOR.

The stock is now ready for the fat-liquor, which can be made by boiling ten pounds of soap in a half barrel of water until dissolved.

Add one gallon of sod oil and eight pounds of degras, and three gallons of neatsfoot oil. Boil until all is dissolved. Then fill the barrel up with cold water—five pails, or about fifteen gallons to the half pack. Heat the wheel to about 120 degrees and fat-liquor in the usual way. Let wheel run for one-half or three-fourths of an hour, then take out stock and hang up so it will dry as quickly as possible in a hot room. When well dried, pile in a cold room for two days or longer if necessary. Then put in a mill or slush wheel and wash with clear, cold water. Run the wheel for at least two hours, or until the leather is thoroughly clean. Hang up again to dry in the hot room, and then lay in piles for a few days, as before. Now dip stock in lukewarm water, dipping two or three pieces at a time, and packing it in a box, covered over night, before staking.

STAKING.

Give first staking with machine or breaker until you get the desired softness. Then hang up on nails over night to dry out the moisture from the dipping. Then throw into the drum and mill with soapstone, using about six quarts of soapstone to a pack of 100 sides. Run for about two hours, take out and stake again with the machine or breaker or arm stake is preferred.

If these instructions are strictly carried out you will have glove and mitten leather which will fully equal in strength, appearance and quality any on the market, and as soft and pliable as could be desired.

SOME TANNERY TIPS.

LIME AND BATE.

If hides and skins are to be unhaired by lime, it should first be thoroughly slaked and dissolved as far as possible. Unslaked pieces of lime often damage the grain, thus puzzling tanners to know where the damage was done. Bate barrels must be kept clean and fresh if the best results are to be obtained.

ARSENIC.

Be careful not to use too much arsenic in the beamhouse. Too little arsenic and too much lime produces soft leather with rough grain. Arsenic requires proper handling, if desirable results are to be obtained.

STUFFING WHEEL.

The stuffing wheel should be so manufactured that it will not fold or crease the leather. For this purpose numerous plugs should be

placed inside the wheel. A speed of from 16 to 20 revolutions per minute is recommended, and for heat steam seems to be preferred to hot air.

STRETCHING OF CHROME CALF.

After setting and oiling, chrome calfskins are stretched on an open or closed frame for the purpose of drying. The skins must be drawn evenly in all directions and kept on the frame until thoroughly dry.

They can be maintained in this dry or "crust" condition a long time before finishing. Stretching the leather with too much force is harmful. The tanned skins should be carefully shaved in order to become smooth and even, as any unevenness will appear dull when the leather is glazed.

GLAZED CALF.

In finishing smooth glazed calf, a seasoning containing very little or no ammonia is better than one having too much, as ammonia has a tendency to draw the grease from the leather, thus producing dullness. A glazed kid seasoning seems to work well on calf.

ADVANTAGES IN COLORING.

Leather to be colored, such as gambier calf, will gain if left in the dry state for a time. A softer and more mellow leather is obtained than if the processes follow each other in rapid succession. Chrome leather, on the contrary, should be given no delay between coloring, fat-liquoring and drying. Chrome skins are generally colored before being fat-liquored, but many tanners obtain good results in doing the reverse of this. A fat-liquor must not contain too much alkali, such as potash or soda, which is harmful to the texture and color of leather; moellon degras gives good result in fat-liquors for chrome leather.

GLOVE LEATHER.

Hides and skins tanned for glove leather are best prepared for tanning by unhairing arsenic and using manure for bate. This process gives great smoothness and a fine texture, which preserves the leather until worn out.

The sulphide of sodium process for unhairing does not produce leather as soft as when arsenic is used. To make glove leather, the best method is to use the chrome tannage, as it is adaptable to every class of hides and skins and produces fine stock. Chrome-tanned sheep and lamb skins, fat-liquored with soap, oil, egg yolk and flour, will yield leather similar to genuine chevreaux. Much of this leather is used for glove and lining purposes in its natural color.

TOUGH AND COARSE GRAIN.

If chrome-tanned skins, when finished, have a rough, coarse grain, in most cases the trouble is due to the amount of lime they contain. During the chrome process, if skins contain lime, the pores become closed and the grain is rough and coarse. Bating must be done carefully and thoroughly, and it is also important that the grain be well worked out. Less time is required for bating in summer than in winter.

SOFT AND TOUGH LEATHER.

Calfskins tanned for colored or glove leather may be obtained to advantage by a mixture of alum, salt, sulphuric acid and gambier. These materials produce extremely tough and soft leather; also give waterproof qualities and a fine, soft grain. After tanning, the skins are oiled in the wheel, dried, then fat-liquored, dried again, and before coloring or blacking or smoothboarded or dull or bright finished. For glove leather give more oil and fat-liquor than for other stock.

PICKLING.

Hides and skins treated in liquor containing salt and sulphuric acid are not only preserved but bleached. Salt, acid and water help make hide material white and clean, and remove all spots and dark places. Pickled skins for coloring yield a better and cleaner grain than when not pickled.

ANILINE DYES.

Water used to dissolve aniline dyes must be soft and clean. If dirt settles at the bottom of a glass of water that has been standing for several hours, this shows that it is not fit to be used for dyeing. Dirty or unfit water produces incomplete coloring. In hand coloring, all brushes and sponges should be kept absolutely clean.

SALT IN TANNING LIQUORS.

Salt is necessary in the tanning of liquors where processed raw material is to be tanned. Sheepskins, which come to the tanner in a processed state, have been pickled in a solution of salt and sulphuric acid by the wool puller to preserve the skins. If no salt were used in the tanning liquors, the skins would swell rapidly and be more or less injured, according as they had been processed more or less.

SALT COUNTERACTS ACID.

The salt in the liquor counteracts the acid and keeps the pores of the skin open so that the skin absorbs the tannic acid readily. Too much salt used in the liquors always results in flabby, hungry leather,

and frys out, giving the skin a rough, sandpapery appearance on the grain after the finished leather has lain in stock a short time. The amount of salt to be used in sumac or in bark liquors varies in accordance with the processing of the raw material.

Very few tanners will admit that salt in hemlock bark liquors is beneficial in tanning upper leather from heavy hides. On leather which the tanner wishes to be as firm as possible he is not likely to use anything of a nature to keep it soft and open.

SALT USED IN TAN LIQUORS WITH GOOD RESULTS.

That salt can be used in tan liquors with good results would, no doubt, to the average tanner of heavy hides for upper leather, seem a foolish statement. The salt is used in the first liquors, and, as the packs are shifted forward into stronger liquors, the salt disappears. The tanned leather is plump and firm and a good fine, plump split can be taken from the grain. The grain side is finished for grain leather, and the splits after being retanned are finished into fleshers. They take the stuffing well, and when whitened a fine smooth surface comes up to receive the finish. No vegetable tanned leather can be washed in water or weak liquors without flatting away and becoming coarse. Especially is this true of leather full of salt. The leather must be freed of all salt as it goes forward in the stronger tanning liquors.

SOUR LIQUORS.

Said a tannery superintendent: I had a talk with a tanner who does not believe in old, sour liquors for green stock to be suspended in when coming from the beam house. His opinion is that old, sour liquors, being full of gallic acid and lime from previous packs, make a coarse and spongy grain, and that the leather will always be of coarse fibre. From his experience with the old, sour liquors he believes the gallic acid killed a large amount of tannic acid, and in strengthening up the green packs containing such a liquor more than one-half of the tanning material was thrown away.

GREEN HIDES MUST BE CLEAR AND FREE FROM LIME.

The only way to make first-class bark tanned leather is to have the green hides free and clear from lime and all impurities before going into any kind of tanning liquor; that every pack of green hides which he handled went into the paddle wheel from the drench and a stream of cold spring water was pumped on them. They are then left to paddle in this water from six to eight hours; when taken out they are white and clean and do not contain any organic matter to sour and kill tannic acid in the liquor.

This tanner was brought up in a tan yard where he was led to believe that green hides were to be put into the liquors as soon as possible after being drenched or they would spoil. He has changed his views. When he saw the big profits that used to be made disappearing, growing smaller and smaller, he looked about for methods to cheapen the cost of production.

RUN HIDES IN COLD SPRING WATER.

One way to lessen the cost of production was to have hides clean before going into liquors. This could be accomplished by running them in cold spring water. The temperature of the spring water is such that it arrests any putrefaction that may have begun in the drenches. All putrefactive matter is washed out of the hides. It is impossible to injure them unless carried to an extreme.

FOLLOW UP LIQUORS DAILY.

Another point which he makes is to have the liquors followed up every day, Sundays included. He said that he or his foreman was on the spot to see that the extract given each pack was well plunged up with the liquor in the vat. This not being done, the extract would settle to the bottom of the vat, and the leather would not be tanned uniformly. It may seem a little thing to be so particular about, but the little things are the things that count, and taking care of liquors in a tan yard is along the same principle as feeding a horse; if you once let him get run down it will cost twice as much to get him in condition again as it would have cost to have kept him in good condition in the first place. It costs much more to tone up rundown vats of tan liquor than it will cost to keep the liquor up where it belongs. The main thing in the conduct of a liquor yard is to keep the liquors sweet and clean.

BARK FIGURING.

How to figure on the number of vats of liquor from a leach of bark. Take a leach of six cords at $8 a cord; that is $48. You will get two double vats of heavy liquor, or 15 degree liquor, which is one-half the price, or $24. You will get two double vats of 12 degree liquor, which equals two-thirds, or $16. You will get two double vats of the next run, which is about 9 degrees, which is one-third, or $8. This makes a total of $48. This applies to upper leather and to double vats.

BIRCH OIL DRESSING.

Many people want to use a little birch oil on their stock after it is finished, and this will make a very nice way of using it:

One pound of castile soap, cut up fine.

Four quarts of boiling water.

Keep this boiling and add very slowly one quart of birch oil. When thoroughly cut, cool off, and keep it covered. Put on stock with a wool swab. In putting this dressing, or scent, as some call it, on the leather, put it on the flesh side, but very lightly. If you get too much on you will be very apt to spot through on the color.

KEEPING RECORDS OF PACKS IN TANNERY.

It is safe to say that every successful tanner "keeps track" of the hides or skins being worked through the tannery. The importance of this is indisputable. Various methods and systems are employed, tanners, as a rule, devising and using such as seen to fit their own processes. The methods employed, however, should give all of the data in the easiest and most practical way.

On the opposite page will be found a system intended for a union crop sole leather tannery. It could be used in any tannery by merely changing the wording of the tickets.

By this system a complete record of each lot of hides or skins as worked through the tannery is kept on a printed form or card, divided or cut into three tickets, as shown, which, for convenience sake, can be designated as *first, second* and *third.*

Let it be assumed that the tannery is putting through a lot of 1,000 hides for union crop sole leather, in packs of 50 hides each, and designated as lot "A".

When the beamhouse foreman starts the soaking of this lot he takes a *first* ticket, and pencils the heading "Lot A, Pack No. 1," and fills in the data in the several spaces at such times as may be required. After delivering the pack to the tan yard, he signs his name or initials on the ticket and gives it to the office. For the next pack the ticket should be headed "Lot A, Pack No. 2," and so on, until completion of this lot with "Pack No. 20." Each side must be stamped with the lot designation and pack number to which it belongs, such as "A1," "A2," and so on. The latter practice being general, further explanation of it is unnecessary.

After the pack arrives in the tan yard, the foreman there takes a *second* ticket, heads it with the lot designation and pack number, fills in date of receipt, the number of sides, and signs with his initials. When the pack is moved to the next department the ticket follows, being handed to the foreman there, who then dates and initials it. This is repeated in every department through which the pack passes. After the foreman of the sorting room has dated and initialed this ticket it is handed to the office.

Before doing this, however, the foreman of the sorting room takes a *third* ticket, which he heads with the proper lot designation and pack

LOT	PACK No.
QUANITY	HIDES
KIND	
SELECTION	Steers Cows Bulls
ENTRANCE WEIGHT	Lbs.
PUT IN SOAK	Date
BEAM HOUSE WEIGHT	Lbs.
DELIVERED TO TAN YARD	Date

REMARKS:

Foreman.

LOT	PACK No.							
								DATE
SORTING	2nd DRYING	ROLLING	TEMPERING	DRYING	CURRYING	TANNING		RECEIVED FOR:
								SIDES
								FOREMAN

LOT	PACK No.

ASSORTMENT:

	SIDES	LBS.
	BACKS No. 1	"
	" " 2	"
	" " 3	"
	SHOULDERS	"
	BELLIES	"
	HEADS	"
TOTAL	LEATHER	"

Sorter.

GAIN %

number, and after the cropping and sorting are done, puts on this ticket all of the data pertaining thereto, signs and sends it to the office.

Each ticket has a hole punched toward the upper end, so that it can be hung on a small hook, of which there should be plenty at convenient places throughout the tannery. These tickets should always be in sight, and close to the packs. As before stated, when the packs are moved the tickets are also. The signing or initialing by the foreman is practically a receipt, and it should be obligatory on him to count the sides of the pack before signing. If at any stage a shortage is noted, it should be reported at the time to the superintendent.

The three tickets properly filled out and delivered to the office, if grouped together, will make a complete original record of the pack. The grouping can be done in several ways. One way is to take an ordinary blank book of proper size, and paste on a leaf a set of three tickets. Another way is to join the tickets together by the use of gummed paper strips or gummed tape, making of them practically one sheet, which can be placed in an ordinary binder. For the latter purpose two holes must be punched in the *first* ticket at the left hand edge. On the *third* ticket there is space to note the gain and any other data required. After all of the sheets of a lot are made up a recapitulation sheet should also be inserted containing a summary and computation of the lot. The tannery will then have a permanent record of the lot and all the data of original entry.

THE USE OF BORAX IN TANNING.

By Andrew Torr.

Many tanners are learning that there is no one material, ingredient, or chemical, which for them possesses so much all around usefulness as borax. The use of borax can, like the use of most other things, be abused, but, when used intelligently, it is one of the greatest benefactors possessed by the modern tanner. I here say that the use of borax may be abused, but I would also add that when abused, its resentment is not so much to be feared as is the resentment of many other misused substances in the tannery. In fact, you may shake and throw it about and stir it up in a most disrespectful manner in the soaks and drenches without its making any great protest; but, when you have pitched it headlong into the tan liquors without discrimination or show of courtesy, you may find that you have made a mistake. You may perhaps do even this once or twice or perhaps several times without an open revolt, but, when you have repeated the incivility so often that the whole tan yard is crying out at the shame of it, you may be pulled up a little.

Now there are most excellent reasons for this; but these I will explain in their turn a little further on, and, just here, go back to what I consider one of the most important points at which borax may be made useful to the tanner. That point is at the soaking.

The soaking is one of the most important operations in the manufacture of leather, and if it be not well and thoroughly done, no after treatment can eradicate the defect. One of the first things to be looked to here is the quality of the water. In addition to their hardness many waters, while apparently pure in aspect and in taste, are infested with microbes, ferments and germs of both vegetable and animal origin, to such an extent as to render them entirely unfit for soaking purposes, without the addition of some good antiseptic. For this purpose nothing quite equals borax. It is safe, sure and inexpensive. Waters may, of course, be such that nothing can render them fit for soaking purposes. Borax is always helpful.

Thorough soaking is of great importance for all classes of leather. Tanners frequently neglect their soaks and many of their troubles can often be tracked back to the soaks—such troubles, for instance, as an unevenly colored grain, difficulty in striking hides through in the tanning liquors, raw spots in leather after it is opened or split; also hard, tinny leather. Since the liquor in the yard will not combine with imperfectly softened hide, thorough soaking, especially for dry hides, is absolutely essential. If the hides be not thoroughly softened not only will the tannage be retarded but generally poor weights will result. An important factor of the soaks is to dissolve out of the hide dried blood and lymph, and to cleanse it externally from adhering dirt. It is quite essential to remove the dried blood and lymph from the hide, because these substances are very prone to putrefaction, and if not removed in the soak are a constant source of danger until the hide is struck through.

When used in soaking dry hides, borax cleanses the dirt from the hair, softens up the grease which has dried on the grain, and forces the water into the body of the hide much quicker than salt or any other known substance.

In the soaking and cleaning of green salted hides before liming borax has no equal. It readily cleanses the hide from all dirt, blood and surface grease, softens up the dirt and grease in the epidermis, and also softens the epidermis itself in such a manner as to allow the lime to readily attack the hair sheaths on the start instead of attacking the coriin, as in the case when hides are placed in the limes with the epidermis filled with dirt and the hair matted together by dried blood. For this reason borax is especially valuable in the beamhouse for all tanners of sole and rough leather. These tanners well know the increased weight in leather gained in the Buffalo method of liming by placing the hides after soaking in a strong lime for twelve or fifteen hours, and then taking them out and placing them in water heated to

a temperature of 100 degrees, in which the hides remain from twenty-four to forty-eight hours. The warm water soaks, softens and swells the roots of the hair and much the same result is obtained as in scalding pigs. This method made solid, tough-fibred sole leather for the simple reason that the lime had not time to eat out or dissolve any of the hide substance; but considerable work was needed over the beam to remove the hair, and considerable scudding was necessary to remove the grease.

It is well known that lime sets dirt and that grease kills lime. If the dirt and scurf are not removed before liming the hide must be reduced. It is just as important to present a clean soft surface to the lime liquor as it is to a tanning liquor.

Tanners are learning that in order to get the maximum weight of leather from a given amount of raw hides the hides must be in a clean, soft condition. They must be brought to this condition by quick soaking. By this means more hide substance is retained. The same is true of the liming, for the quicker the hair sheaths are started, less hide substance dissolves. All of these benefits are made possible by using borax in the soaks.

BORAX ON UPPER LEATHER.

Today tanners of upper leather are forced to meet a new condition of things, a condition brought about by the attempts of progressive tanners to split the hide in the beamhouse. Heretofore the tanner of upper leather has had two firm surfaces to deal with. Now, when the hide is split in the beamhouse he has one firm surface and another less firm, more spongy and loosely interwoven surface. In this case the treatment in the beamhouse should be the same as for sole and rough leather, since all possible hide substance must be held. The inner part of the hide is easily affected by lime, and before the hair sheaths are ready to start a large amount of the albuminous substance may be dissolved, leaving the surface of the remaining part of the hide, after splitting, in a soft gelatinous condition. Such a surface when presented to the tanning liquor curls and shrinks. This may be prevented by using borax in the soaks. It not only cleanses the hide from the dirt and grease, but shortens the soaking process and prevents the hide substance, coriin, from being dissolved; then, when such cleansed hides are placed in the lime liquor, the grain being in a soft, silky condition, allows the lime to work instantly on the hair sheaths, and these are ready to be removed before the hide proper has been attacked at all.

In the manufacture of this leather, as well as in that of sole and rough leather, reducing in a drench made from animal excrement is not to be thought of, but a drench made from borax or boric acid will be found to be the proper thing for cleansing the hide of sulphide of sodium and lime.

BORAX FOR WOOL SKINS.

Borax is fast proving its usefulness in the soaks to all tanners of wool and fur skins. It not only cleanses the wool and fur and softens the pelt itself, but prevents the slipping of the hair in spots, so noticeable in this class of goods. A good 23 per cent can be saved in labor and material by thoroughly cleansing wool and fur skins before tanning. Any sort of a tanning liquor sets dirt, and if the hair or wool be not well cleansed before tanning, double the amount of soap and labor will be necessary.

Formerly tanners of shearlings for soles, etc., received $2.50 to $3.00 per dozen from the dealers in the trade for manufacturing such skins. Today many of them have learned what borax will do; and by placing it in their soaks they are enabled to take this class of work at $1.50 to $2.00 per dozen, and make as much profit as they formerly did when receiving the larger sum.

Some of the costly fur skins are of an extremely oily nature and heretofore many have been lost or damaged in the soaking. By the use of borax this is being prevented. The borax cuts the grease, removes the blood and lymph and turns the skins out in a beautifully clean, healthy condition. By its use today many a skin is being saved which would otherwise be lost.

Borax can be used just as successfully in the preparation of wool skins for the pulling process. The wool is cleansed, preparatory to pulling, to some extent by the use of the washing machine. Many of these skins are dry flint, foreign skins, the wool being full of dried blood, grease and filth. It is always difficult to soak such skins, as the grease has been drawn from the body of the skin during the curing and forms a cementary matter on the flesh side, making it almost impossible for water to penetrate. On being painted by sulphide of sodium the glassy surface is not affected and the wool fails to start. The skin is thrown back for further soaking, and the process of painting is repeated until the wool can be pulled, which is often at the expense of the pelt itself.

Many thousands of skins today are being thrown into the glue stock heap for the want of proper softening substances in the soaks. Many of these might be saved by simply adding a few pounds of borax to the water for soaking.

Some have questioned the advisability of using borax in the tan liquors, arguing that it kills tannic acid. This is true. Borax does kill a certain percentage of tannic acid. But, notwithstanding this fact, borax properly used greatly accelerates and facilitates the tanning process. It also gives good weight and color and prevents "drawn grain" when used as it should be, in the early stages only.

In a tan liquor it is not only the tannin which is of value, but every particle of absorbable matter that the liquor contains—mind I

do not say assimilable, but absorbable matter. Hemlock bark contains a large percentage of "reds," which are the anhydrides of the tannin. These reds are not soluble in cold water, and only to a certain extent in tannic acid, but by the addition of borax all are made soluble, while at the same time the borax corrects any tendency towards poor color which may be caused by them.

The extractive matters accompanying tannin are far from remaining inert. They contain filling properties. They also produce by their dissociation, substances which are generally acid and which naturally facilitate the absorption of tannin by the hides during the tanning process. Borax assists in the liberation of these extractive matters, in the leaching of the bark. But, having used enough borax to accomplish this, we should not upset the good work by adding more borax, and destroying this acidity. Neither should we, having used borax to liberate matter which adds to the weight of the hide, turn about after this has been fixed in the hide and use borax until we have withdrawn this weight giving matter. Some tanners have done this thing and then have blamed borax and not themselves.

WHEN NOT TO USE BORAX.

Borax should never be used in the latter stages of tanning. After the hide has been about one-half tanned all following liquors should be free from its effects. If borax be used in the proportion of 5 pounds to 1,000 gallons of liquor and that proportion be kept up in every run of liquor from the leaches the whole yard will, in the course of two months, be under the influence of borax, extremely disastrous results following.

My experience with borax in the liquors has proved to me that if it be used throughout the process, the resultant leather will invariably be soft, spongy and of light weight; but if it be used only in the first stages, and in the right proportion, the resultant leather will be excellent as to weight and color, will possess a beautiful grain, and will, in addition to this, be turned out in the shortest possible time with the least expenditure of labor.

Before starting in with borax in my tan liquors I had some talk with a chemist concerning the matter. His advice to me was to let the stuff alone. This advice, of course, being based on the fact that an alkali neutralizes an acid.

I was not satisfied with this, however. We practical tanners know that although the chemists have assisted us in many things, they are not infallible, especially in the matter of tanning materials. It is well known that the tannic acid of most tanning materials has never yet been isolated.

I went ahead with my experiments and, like many others, I suppose, I "burnt my fingers." I used borax, 5 pounds to the 1,000 gallons,

from start to finish. My hides tanned rapidly. The leather came out beautiful in color, and showed a remarkably smooth, handsome grain; but alas! the weight I found was not there. Notwithstanding this, however, I was still possessed of the idea that borax could be used in the tan liquors in such a manner as to be only beneficial. After much experimenting, I at last arrived at the conclusion that the theory which I have already stated, concerning the action of the borax on the extractive matters contained in the bark, and its action on the hide after these extractive matters have once been fixed in the hide, was true.

The method which I finally adopted and which proved satisfactory in every respect, follows:

The hides were first plumped, then suspended in a liquor made up by putting 6 pounds of dissolved borax into a vat containing 1,200 gallons of hemlock bark liquor, and then pumping this liquor onto a leach and leaving it to steep for the second run. The liquor on coming from the leach indicated 8 to 10 degrees strength. Of course this liquor when it came back from the leach ready for the hides did not contain the strength of six pounds of borax, as the bark, acting as a sponge, had absorbed a portion of it. When this liquor, in its turn, was pumped on the bark in the next leach ahead no extra borax was used, and a portion of that already in the liquor was absorbed by the bark in this leach. Before making the third shift two and one-half pounds of borax were dissolved and added to the liquor. After this no more borax was added, and when the tanning process was about half completed, the leather was given a fresh liquor, or in other words, a liquor containing no borax whatever.

In this manner each pack of hides was handled. Certain conditions may alter the proportion of borax to be used. For instance, whether the bark be dry, well drained, or sloppy. In this, as in most other things in the tannery, no absolutely hard and fast rule can be given.

In splitting hides green in the beamhouse for the purpose of putting the grain into the chrome tannage and the split into bark or extract, the split has been found to curl and roll up as soon as it comes in contact with the liquor, the surface exposed by the splitting being very tender and affected by even weak liquors. All sorts of means have been tried to overcome this, but borax seems to be the only thing of any use.

Borax may be used with excellent results to preserve hides and skins as they come from the animal's back. Packers who immerse their hides in pickle to preserve them find a little borax goes a long way, one pound doing the work of several pounds of salt. Hides that have lain in the salt for any length of time are frequently found to be rusty, but where borax is used the danger of this is overcome to a great extent.

If used in preserving hides or skins, or if used in the soaks, the antiseptics and disinfectant properties of the borax will protect work-

men who handle the skins from contracting disease through diseased skins. One of the most malignant and dangerous of these diseases is anthrax. Recently much attention has been given to this subject, and hides and wool are now thoroughly inspected to prevent the importation and spread of this disease. I have personally known several cases where workingmen having abrasions on their hands or arms have been inoculated with this disease by handling skins. Two of these cases were very serious, one proving fatal. To prevent such occurrences as these, borax is of inestimable value, as it has been proven to be a safeguard against these germs.

BORAX IN LEATHER COLORING.

It is well known that only the softest water should be used for washing skins preparatory to coloring them, and as some tanners do not have such water they use soda to soften it. Borax is much better for the purpose, as in addition to its mildness it makes a good bottom for holding the color.

Borax is extremely useful in neutralizing any free acid that may remain in acid tanned skins. The dye, especially the basic dyes, will strike a fuller color than they otherwise would, without the borax. It also assists in getting rid of any free tannin there may be left in the skins. This is important, as free, loose tanning tends to precipitate the dye on the tray bottom. Of course the skins for dyeing must be run through this borax water previous to entering the dye bath. The water should contain about one-half per cent borax. In the dye bath a little weak acid such as lactic or acetic will have the effect of reducing the affinity of the color for the leather. Borax in the water used previously to dyeing prevents the running of the dye in the skin.

Borax is now being extensively used in Germany, especially in the dyeing of furniture leather. According to "Der Ledermarkt," an excellent dressing for the prevention of the rubbing off of colors from this class of leather may be made in the following manner: Boil together in an earthen pot 2½ litres of water, 25 grammes of borax and 35 grammes of shellac, adding while it is boiling a little anilin color to correspond with that of the leather to be treated. This mixture is then allowed to cool and is ready for use.

This dressing is to be applied to the leather with a very soft sponge, slowly and with care, so as to avoid streakiness. Different pots and sponges must be used for each color, and should be thoroughly washed before using, otherwise there will be danger of leaving the leather streaky and spotted. Care must be taken, too, in selecting the shade to correspond with that of the leather. After applying the dressing the skins are hung up by the head, grain side outwards, to dry. The rooms should not be too warm, and after hanging for a couple of hours the skins should be taken down and lightly brushed off with a soft cloth.

This dressing does not affect the character of the leather in the least, and effectually stops the rubbing off of the color.

In the morocco factories borax is excellent to use in the water for making "sigs," and also in the logwood; then in the currying shops it gives good results in the blacking and pastes.

In the chrome tannage I have found the use of borax in the water for washing after the second bath to be remarkably good for removing the acid and keeping the grain smooth.

I know of no other one substance used in the tanning that possesses the all around usefulness possessed by borax. Its wholesome, sweetening, disinfectant properties are simply wonderful, and in the prevention of the formation of bacterial organisms its worth can hardly be estimated in the soaking.

BLEACHING RUSSET LEATHER.

[Extract from the "Leather Industries," published in "The Shoe and Leather Journal," of Toronto.]

After the leather is split by a belt knife, re-tan in the usual way, and when tanned take the leather to the scouring machine and scour well on both sides. Take, say, twenty-five sides and put them in a drum. Have the drum made with about a dozen plugs in it; place the twenty-five sides in the wheel, put plugs in door in, and run in through axle wheel forty gallons of water with borax.

Have the borax solution all ready, prepared as follows: Ten to eleven pounds borax to forty gallons of water. "Cook" solution in fifteen gallons of water, then cool off sufficiently for the hand to bear the heat. Start the wheel as the borax solution is being put in; allow the wheel to run, say, twenty minutes, then remove the plugs and run the wheel ten minutes more. At the same time run in some lukewarm water through axle wheel or through door. Care must be taken not to have the water over lukewarm, or the leather will be spotty. After a few minutes it can easily be seen if the water coming from the wheel is getting clear; leave sides in wheel and give them a strong solution of sulphuric acid, made as follows: Take a barrel of cold water and put in enough acid to bring the solution to thirty degrees barkometer, or until it will bite the tongue. Let them run ten minutes with the plugs in, after which remove them, and pour the acid water out of the wheel in motion. At the same time, throw in some water, until no acid can be detected by the taste in the water coming from the wheel. The sides should then be sumached in a wheel or paddle—a paddle wheel is the proper thing—sumach them two or three hours; good sumach should be used, as poor sumach will leave iron spots. Keep the leather in motion while in sumach, the solution being more than lukewarm; a steam pipe should be connected with paddle wheel so that heat can be

supplied when needed. After sumaching rinse off in lukewarm water and a nice russet is the result, ready for colors or russet.

BORAX IN THE TANNERY AND CURRYING SHOP.

The fact that leather may either be done or undone in the beamhouse is being demonstrated more clearly every year.

Through the efforts of the tannery chemist many difficulties which the average tanner believed due to the action of tanning materials, or to the lack of care in the finishing, have been traced back to lack of knowledge in the beamhouse.

It is now known that such difficulties as pipie grain, loose bellies and flanks, poor weight, uneven colored grain, etc., originate in the beamhouse. The day has gone by in which mistakes made in the tannery may be faked up in the currying shop by the use of stuffing.

Conditions have changed in regard to both the tanning and the finishing of leather, and, to meet the demands of the modern tannage and finish, the hides or skins must come to the tannage in a full, soft condition, free from lime, and *showing the least possible depletion of hide substance.*

The chemist has done much for the tanner. He has gone back to the beginning, back to the beamhouse, to the water used in soaking and depleting the hides or skins; he has proven that a lack of knowledge in regard to the *chemical properties of the water used may cause irrevocable difficulties.*

ACTION OF HARD WATER ON HIDES AND SKINS.

Considerable has been said from time to time concerning the action of the air on limed hides or skins, and the effect produced on the grain by such action, but very little has been said concerning the *action of hard water on the fibre* of hides or skins as they come from the limes preparatory to unhairing. Nevertheless it is a big mistake to place limed hides or skins in hard water.

By placing limed hides or skins in hard water *Chalk of Lime is formed* in the fibre. This not only causes the grain to be rough after unhairing, but when the hides or skins reach the tanning liquors, compounds are formed by this chalky substance uniting with the acids, which result in spotted grain.

This uneven colored grain is a great loss to the manufacturers of such leathers as sole leather, rough leather, or colored Russia leather.

Experience has proven that even in low drenching or bateing, chalk of lime clings tenaciously to the fibre and causes a big loss in tannic acid. *These difficulties may be prevented by the addition of Borax to the water.*

BORAX PREVENTS FORMATION OF CHALK OF LIME.

Borax not only prevents the formation of chalk of lime, but by its use the grain of the hide or skin is made soft and silky, thus allowing the hair and scurf to be removed readily.

By the use of Borax in the rinse water a large amount of lime is removed and the green stock needs then but little drenching to remove the remaining lime.

The old-time tanner depended upon the acids in old bark liquors for killing lime left in hides after being drenched in animal excrement. These old liquors were made from ground bark, and through the ageing of the sugary compounds contained in the liquor, acids were formed which not only killed lime but plumped the hide and made a mellow grain. Today a different condition of things confronts the tanner; the use of extracts has increased until now very little ground bark is being leached for liquors. *Liquors made from these extracts do not kill lime* and plump and mellow the grain as did the old bark liquors.

Frequently in using soft water for rinsing hides or skins the addition of borax proves extremely beneficial, since soft waters are often found to be charged with carbonic acid, which gives in a great measure the same effect on the grain as is produced when a limed hide is exposed to the air.

Everyone who has ever worked in a beamhouse has noticed the crystals which form on the surface of a lime liquor if it remains undisturbed for a few days.

BORACIC ACID FOR DRENCHING OR BATEING HIDES.

For drenching, or bateing hides or skins on coming from the rinse water, boracic acid is one of the best substances known.

By its use the hide or skin is entirely freed from lime without loss of hide substance, the grain is made soft and silky, and the fibres are put into a perfect acid condition to receive the tannage.

In the combination tannage, where a bacterial drench is called for, the boracic acid bath as a wash for the skins after drenching, removes all traces of lime. In the combination tannage this is more essential than in the bark tannage. If any lime be left in skins where a gambier tannage is to be used, a reddish hue will be set in the grain. This defect is often noticed by fancy colorers and at the present time many are trying to overcome the difficulty.

In the combination tannage there are no acids to kill the lime and make a mellow grain, consequently extra care should be given in the beam house that no chalky compounds be allowed to set in the fibre.

In the chrome tannage, there being no filling matter in that tannage, it is important that the hides be not depleted and that the raw stock be free from lime.

Borax in the rinse water, and boracic acid for a drench, make a combination which will *insure an even run of raw hide* that will produce leather of soft, mellow grain with full bellies and flanks, and *that will not pipe.*

BORAX FOR WASHING COLORED LEATHERS.

Too much cannot be said in favor of washing chrome tanned leatherd in borax to free it from acid. The washing of chrome leather is a mighty important part of the operation. If the stock *is not properly washed* there is trouble all round.

Strong alkalies make the leather hard and rubbery and cause difficulty in the dyeing, in the putting out, and all through the finishing room. Bicarbonate of soda is used for the purpose, and frequently it happens that *the neutralization is uneven* or the *process is carried too far.* Borax is the safest, surest, neutralizing material known. It not only removes the acid, but it leaves the grain soft and silky and open for the coloring and seasoning processes.

In the dye bath *borax gives a lively color on any class of goods,* and stops any running of the dye. It is now being used extensively to prevent the color rubbing off on furniture leather and the fading of fancy colored Russia leather.

The fact that *borax prevents running of the dye and makes a color fast* is being taken advantage of by manufacturers of shoe dressings. They use it largely in the manufacture of blackings, stains, etc.

The value of borax for bleaching bark tanned leather and stripping it of surplus tannage is well known. By the use of borax a more even and lasting color is produced, and softer grain, than can be produced by the use of soda or other alkalies. Borax cuts the gums and filling matter on the surface, *making the grain flexible and of good color.*

BORAX FOR BLEACHING CHROME STOCK.

In bleaching chrome tanned stock borax does not disturb the tannage, but it thoroughly removes the acid and leaves the stock in a full, smooth condition and of a nice white tint that does not discolor when exposed to the air.

The wonderful bleaching properties of borax are being taken advantage of in the shoe factory for preventing water stains and for bleaching soles.

By using a small amount of borax in the water for wetting the sole the surface is opened, thus allowing the water to penetrate evenly, and a clear, even colored bottom is produced. The sole is also made flexible and chipping of the edges is prevented. Another important point is that the soles are put into condition to readily absorb the stains.

A foreman states that he "had tried all sorts of highly recommended

bleaches without results, but borax produced clear and spotless bottoms at small expense and with but little trouble in preparing it."

VALUABLE RECIPE FOR BLEACHING AND SOFTENING SOLES.

Take six to eight ounces of borax, dissolve in one gallon of water at blood heat, and dip the soles. The borax not only cuts the glucose and gum on the surface of the soles, but the leather is made flexible, so that when the stains are applied the coloring matter is readily absorbed.

If used on oak tan leather, as well as union and hemlock, do not dip such soles in the water where union or hemlock stock has been dipped, or the soles will darken. Use separate wooden pails for each.

If using union and hemlock stock one wishes to have still a lighter color bottom than the original color, dip the soles in a solution of boric acid and water, in the proportion of four ounces of boric acid to a gallon of water.

Boric acid is so mild it will not injure the fibre of the leather, nor will it eat away any coloring matter that is applied in the after processes.

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